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NATIONAL DAM SAFETY PROGRAM. DRESSER IND OLD NUMBER 1 NO NAME 5--ETC(U)
AUG 79 K B KING, M P FORREST, D R SANDERS DACW43-79-C-0037

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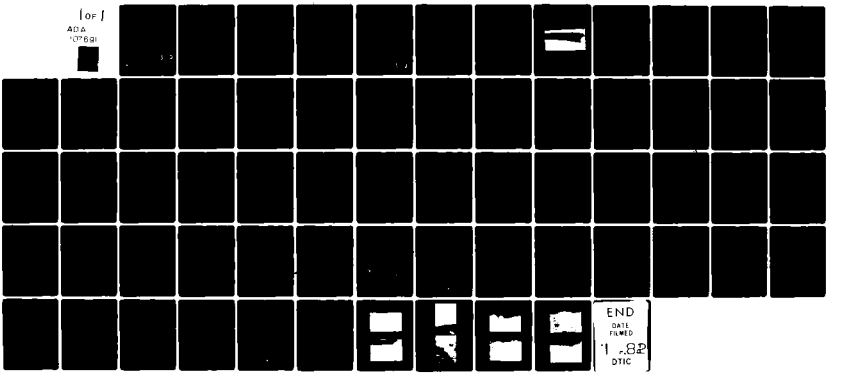

LEVEL II

1

MISSISSIPPI-KASKASKIA-ST. LOUIS BASIN

NO NAME 587 DAM
WASHINGTON COUNTY, MISSOURI
MO 30753

AD A107 [illegible]

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

AUGUST 1979

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A107 691 / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Dresser Ind Old #1-NONAME 587 (MO 30753) Washington County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) International Engineering Company, Inc.	8. CONTRACT OR GRANT NUMBER(s) DACW43-79-C-0037
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE August 1979 13. NUMBER OF PAGES Approximately 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for release; distribution unlimited.	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	
18. SUPPLEMENTARY NOTES	
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety, Lake, Dam Inspection, Private Dams	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

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☆ U.S. G.P.O. 1980-665-141/1299

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

LMSED-P

SUBJECT: No Name 587 Dam, Phase I Inspection Report

This report presents the results of field inspection and evaluation of the No Name 587 Dam (MO 30753).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, emergency by the St. Louis District because of the following conditions:

a. Excavation of gravels from the dam, which is reducing the available freeboard and the ability of embankment to retain floodwater.

b. Sloughing of the downstream embankment near the northeast corner of the impoundment.

c. Erosion at the northeast corner in the diversion ditch, which is undercutting the foundation soils at the downstream toe of the dam.

d. Seepage, very soft soils and deposits of loss silt indicate piping has occurred and may still be active.

Another unsafe condition which exists at this dam is the steep downstream slope.

For Phase I reports, the extent of the downstream damage zone has been determined assuming that all materials contained by the tailings dam are in a liquid state.

Submitted By: SIGNED
Chief, Engineering Division

26 FEB 1980
Date

Approved By: SIGNED
Colonel, CE, District Engineer

26 FEB 1980
Date

NO NAME 587 DAM

WASHINGTON COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30753

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY

INTERNATIONAL ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
SAN FRANCISCO, CALIFORNIA

UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

AUGUST 1979

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	No Name 587 Dam
State	Missouri
County	Washington
Stream	Rubeneau Branch (Tributary of Mill Creek)
Date of Inspection	22 March 1979

No Name 587 Dam was inspected by a civil engineer and an engineering geologist from International Engineering Company, Inc. of San Francisco, California. This dam is owned by Dresser Minerals Division of Potosi, Missouri. The purpose of the inspection was to assess the general condition of the dam with respect to safety. The assessment was based on an evaluation of the available data, a visual inspection and an evaluation of the hydrology and hydraulics of the site to determine if the dam poses hazards to human life or property.

The purpose of the dam is to impound tailings from a barite separation and beneficiation operation. The dam completely encircles the impoundment. Runoff from the watershed is diverted around the impoundment via diversion ditches.

No Name 587 Dam was inspected using the "Recommended Guidelines for Safety Inspection of Dams" furnished by the Department of the Army, Office of the Chief of Engineers. Based on these Guidelines, this dam is classified as intermediate size. The U.S. Corps of Engineers has classified this dam as having high downstream hazard potential to indicate that failure of this dam could threaten life and property. The damage zone estimated by the U. S. Corps of Engineers extends approximately eight miles downstream of the dam. Information provided by the Corps of Engineers and the inspection indicates that about five dwellings, two railroad bridges, a highway bridge and the town of Mineral Point with about eighty dwellings are within this damage zone.

The results of the inspection indicate the absence of facilities for discharging floodwater and inadequate freeboard and that the dam does not meet the criteria given in the Guidelines for a structure with the size and hazard potential of No Name 587 Dam. As an intermediate size dam with a high hazard potential, the Guidelines specify that the discharge capacity and/or storage capacity should be capable of safely handling the Probable Maximum Flood (PMF) without overtopping the crest. The PMF is the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that is reasonably possible in the region. The results of the hydraulic and hydrologic analyses indicate that the dam cannot handle 50 percent of the PMF without overtopping the embankment. It was also calculated that the dam cannot retain the 100-year flood (a flood having a 1 percent chance of being equalled or exceeded in any 1 year) without overtopping the dam. Results of the analyses indicate that it is marginal whether

or not the dam can retain the 10-year flood (a flood having a 10 percent chance of being equalled or exceeded in any 1 year) without overtopping the crest; this also applies to 14 percent of the PMF.

Adequate overflow facilities and/or freeboard should be provided so that the impoundment can handle the PMF without overtopping the crest and without significant erosion of the embankment.

Adequate erosion protection to prevent wave erosion should be provided on the embankment slope adjacent to the pond located to the west of the impoundment. Also, adequate erosion protection should be provided in the diversion ditches to prevent flows from eroding the embankment. Excavation of gravels from the embankment is taking place. This activity is decreasing the available freeboard and the ability of the embankment to retain floodwater. This activity should cease and the excavated areas should be repaired.

Seepage and stability analyses of this dam are not available. These studies should be performed by a professional engineer experienced in the design and construction of tailings dams and should be made a matter of record. The results of these analyses could indicate the need for remedial measures. Remedial work should be done under the direction of a professional engineer experienced in tailings dam design and construction.

An inspection and maintenance program should be initiated. Periodic inspections should be made and documented by qualified personnel to observe the performance of the dam and diversion ditches.

It is recommended that the owner take action to correct the deficiencies described.

Kenneth B. King, P.E.

Michael P. Forrest, P.E.

Donald R. Sanders, R.G.

OVERVIEW OF THE WEST END OF THE TAILINGS
IMPOUNDMENT OF NO NAME 587 DAM AND UPSTREAM POND

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NO NAME 587 DAM
ID NO. 30753

TABLE OF CONTENTS

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSES

LIST OF PLATES

PHOTOGRAPHS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NO NAME 587 DAM - ID NO. 30753

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the No Name 587 Dam be made and authorized International Engineering Company, Inc. to make the inspection.

b. Purpose of Inspection. The purpose of the inspection was to assess the general condition of the dam with respect to safety, based on available data and a visual inspection, to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams". These Guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) No Name 587 Dam is an earthfill dam that completely encircles the impoundment. The dam impounds tailings from a barite separation and beneficiation operation, and the tailings consist of soft, red-brown, silty clay that were deposited as a slurry in a water environment. Tailings are no longer conveyed to the impoundment. The tailings surface is overgrown with brush and small trees.

(2) There are no open channel spillways or active outlets at this impoundment. A pond is located adjacent to the impoundment on the west (upstream) side. Diversion ditches are located along the north and east sides of the impoundment.

b. Location. The dam is located in the eastern portion of Washington County, Missouri, as shown in Plate 1. The dam (shown in Plate 2) is located in Section 8, Township 37 North, Range 3 East.

c. Size Classification. This dam is greater than 40 feet high and less than 100 feet high and is therefore in the intermediate size classification, according to the "Recommended Guidelines for Safety Inspection of Dams".

d. Hazard Classification. The U. S. Army Corps of Engineers has classified this dam in the high hazard potential category. The damage zone, estimated by the Corps of Engineers, extends approximately eight miles downstream of the dam. Information provided by the Corps of Engineers and the inspection indicates that about five dwellings, two railroad bridges, a highway bridge and the town of Mineral Point with about eighty dwellings are within this damage zone.

e. Ownership. This dam is owned by:

Dresser Minerals Division
Dresser Industries, Inc.
P.O. Box 8
Potosi, Missouri 63664

f. Purpose of Dam. The purpose of the dam is to impound tailings from a barite separation and benefication operation.

g. Design and Construction History. Mr. A. E. Williams, Plant Manager of the Dresser Minerals Division, indicated that construction of the dam began about 1942. No design information or construction data are available.

h. Normal Operating Procedures. No operating records are known to exist. Dresser personnel consider the tailings impoundment inactive because tailings are no longer conveyed to the impoundment. Available information indicates that the impoundment became inactive in the mid-1960's.

1.3 PERTINENT DATA

Field surveys were made by Booker Associates, Inc. of St. Louis, Missouri on 3 April 1979. The survey information is shown in Plates 3, 4 and 5.

a. Drainage Area. Since the impoundment is completely enclosed by an embankment and because runoff is diverted around the impoundment, the only drainage area is the impoundment itself, which has an area of 36 acres. (Aerial photograph, scale: 1 inch = 660 feet, 1971.)

b. Discharge at Dam Site.

(1) Overflow pipe - There is no active overflow pipe at this dam. The 12-inch diameter steel pipe at Station 32+06, with an invert at El. 921.6, is about 5 feet higher than the minimum dam crest (El. 916.5) and, therefore, cannot function as an outlet.

c. Size Classification. This dam is greater than 40 feet high and less than 100 feet high and is therefore in the intermediate size classification, according to the "Recommended Guidelines for Safety Inspection of Dams".

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b. Discharge at Dam Site.

(1) Overflow pipe - There is no active overflow pipe at this dam. The 12-inch diameter steel pipe at Station 32+06, with an invert at El. 921.6, is about 5 feet higher than the minimum dam crest (El. 916.5) and, therefore, cannot function as an outlet.

(2) Spillway - There is no spillway at this dam. Not applicable.

(3) Maximum experienced outflow at damsite - no available information.

c. Elevation (Feet above M.S.L.)[1/]

(1) Top of dam - Varies from El. 913.3 to El. 926.4 along the crest roadway. Because the upstream berm along the west end of the impoundment is at least 3 feet higher than the roadway, the minimum elevation of the embankment crest adjacent to the tailings impoundment is about El. 916.5 at the west end.

(2) Tailings surface - Varies from El. 913 ± at the northwest corner to El. 919.5 at the east end of the impoundment.

(3) Pond water surface upstream (west) of impoundment - El. 905.3 (on date of survey).

(4) Streambed (at northeast corner of impoundment) - El. 860 ±.

d. Reservoir. Approximate maximum dimensions of impoundment: 1600 feet (north-south) by 1800 feet (east-west). (Aerial photograph, 1971, scale: 1 inch = 660 feet.)

e. Storage.

(1) Approximate active storage for pool at top of dam (El. 916.5) - 11 acre-feet.

(2) Estimated approximate quantity of tailings in impoundment - 1300 acre-feet.

f. Reservoir Surface Area.

(1) Water surface area for pool at top of dam (El. 916.5) - 10 acres ±.

(2) Impoundment area - 36 acres.

[1/] Elevations are based on a reference datum of El. 910.37 feet M.S.L. at the temporary bench mark (see Plate 3). This elevation was established from the temporary bench mark set at Dresser No. 1 Dam (I.D. No. 31117). The elevation of that bench mark was estimated from the topographic quadrangle.

g. Dam.

(1) Type - Earthfill.

(2) Length - 5373 feet.

(3) Maximum height - 60 feet ±.

(4) Top Width - Varies from 20 to 40 feet.

(5) Side Slopes

(a) Downstream - 1.5(H) to 1.0(V).

(b) Upstream - Unknown.

(6) Zoning - The embankment probably consists of a clay starter dam with overlying sands and gravels that are finer than 7/8-inch.

(7) Cutoff - It is not known if a cutoff was constructed.

h. Spillway. None.

i. Regulating Outlets. None.

j. Diversion Ditches. A diversion ditch is located along the north side of the impoundment adjacent to the downstream toe of the dam. The ditch conducts runoff impounded in the upstream pond located at the west end of the impoundment to the Rubeneau Branch of Mill Creek at the northeast corner of the impoundment. The diversion ditch is V-shaped and about 6 to 8 feet deep. Rubeneau Branch has been diverted around the south and east sides of the impoundment, and this diversion ditch has a trapezoidal shape and is about 10 feet deep. The embankment gravels form the west side of the diversion ditch.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design drawings or data were available.

2.2 CONSTRUCTION

No detailed construction information was available. Mr. A. E. Williams, the owner's representative, indicated that construction began about 1942. This dam was probably constructed by the method generally used to construct barite tailings dams in southeast Missouri. An earthfill starter dam was probably constructed across the drainage. Sands and gravels were then hauled in trucks from the mill and dumped on the crest to raise the dam. The sands and gravels were spread and were pushed over the upstream and downstream faces of the dam. The material pushed over the upstream side rests on the tailings. The sands and gravels placed in this manner are in a loose state and are at their natural angle of repose on the downstream face. The centerline of the dam remained approximately at the same position as the embankment was raised above the starter dam. Material on the crest was compacted by construction equipment.

2.3 OPERATION

No records of operation were available.

2.4 EVALUATION

a. Availability. No design or construction records were available. The only information made available to the inspection team was provided during conversations with the owner's representative.

b. Adequacy. The field surveys and visual inspections documented herein are considered adequate to support the conclusions of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available; the lack of this information is considered a deficiency. These seepage and stability analyses should be performed for the appropriate loading conditions, including earthquake loads, and should be made a matter of record.

c. Validity. Not applicable because no design data were available.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. The dam was inspected by a civil engineer and an engineering geologist from International Engineering Company, Inc. on 22 March 1979. Mr. A. E. Williams of Dresser Minerals met with the inspection team on 21 March 1979. The impoundment contains barite tailings; however, tailings are no longer conveyed to the impoundment.

Photographs taken during the inspection are included in this report. The field locations of the photographs are shown in Plate 6.

b. Project Geology. The area geology was mapped as cherty dolomite of Cambrian Age (Geologic Map of Missouri, Missouri Geological Survey, scale 1:500,000, 1979). In the reservoir area, dolomite outcrops were observed to be horizontally bedded and closely jointed. The surface soils consist of reddish brown silty clay containing resistant nodules of chert. The surface soils generally appear to be less than 10 feet thick.

c. Dam. The plan of the dam is shown in Plate 3. The profile and cross-sections of the dam are presented in Plates 4A, 4B, 4C, 5A, and 5B.

The dam is almost free of vegetative cover; however, some trees were observed growing through the downstream face and appeared to be rooted in the foundation. The tailings pond surface is heavily vegetated with small trees and brush.

No detrimental settlement, depressions, cracking, sinkholes or animal burrows were observed in the embankment. Flow in the Rubeneau Branch at the northeast corner of the impoundment has cut a deep V-shaped channel and is undercutting the foundation soils at the toe of the dam. Sloughing of the foundation soils was observed (see Photo 8). Also, some erosion along the toe of the north end of the impoundment was observed where the diversion ditch is adjacent to the embankment toe. Gravels have been excavated from the dam at the northwest corner of the impoundment and possibly along the west side of the impoundment.

A seep is located at the toe of the dam at the north side of the impoundment at Station 21+80 (see Plate 3). The flow rate was estimated to be about 1 to 2 gpm and the water was clear. The soil at the location of the seep is very soft. Loose silt appears to have been deposited at the seep; this suggests that piping may have occurred and may still be occurring to some extent.

The difference in elevation between the dam crest and the tailings surface varies from 0.5-foot to about 7 feet. No erosion protection exists on the downstream face of the dam adjacent to the pond on the west side of the impoundment.

d. Appurtenant Structures. A 12-inch diameter steel pipe passes through the embankment at the northwest corner of the impoundment (see Plate 3). This pipe is located at the highest tailings level within the impoundment and would not act as an overflow pipe.

A diversion ditch is located along the north side of the impoundment adjacent to the downstream toe of the dam. The ditch conducts runoff impounded in the upstream pond located at the west end of the impoundment to the Rubeneau Branch of Mill Creek. Also, Rubeneau Branch has been diverted around the south and east sides of the impoundment. Both ditches are primarily in clayey soil.

e. Reservoir Area. The watershed area is characterized by downward sloping ground to the south and east. Much of the watershed consists of mined areas. These areas have irregular topography, which consists of numerous pits and stripped land. This area is partially vegetated with small trees and brush. The mined areas are subject to erosion and sedimentation. The impoundment consists of silty clay tailings; the tailings surface slopes downward to the west and north. Some consolidation of the tailings has probably taken place. The impoundment is overgrown with brush and small trees.

f. Downstream Channels. The impoundment was constructed across Rubeneau Branch of Mill Creek. Runoff is diverted around the north side of the impoundment and eventually flows into Rubeneau Branch. Rubeneau Branch was diverted around the south and east sides of the impoundment. Rubeneau Branch intersects Mill Creek immediately to the north (downstream) of Mineral Point, approximately 1/2-mile northeast of the impoundment.

3.2 EVALUATION

Water flowing in the Rubeneau Branch diversion ditch at the northeast corner of the impoundment and in the diversion ditch along the north side of the impoundment is undercutting the foundation soils at the downstream toe of the dam. This erosion process could cause significant stability problems during times of high flow in the diversion ditch. No indications of slope instability were observed in the embankment itself; but the downstream slope is steep (at the angle of repose of the gravel), and its long-term stability cannot be determined until seepage and stability analyses are performed. The soft ground at the seep could adversely affect embankment stability. The practice of excavating gravels from the dam is reducing the available freeboard and the ability of the embankment to retain floodwater. No slope protection is provided on the embankment slope adjacent to the pond located at the west end of the impoundment.

The embankment is a relatively porous granular structure above the tailings surface. If the water level were to rise above the tailings surface due to flood runoff, there could be significant seepage through the embankment which could adversely affect the stability of the dam.

The 12-inch diameter steel pipe cannot discharge water from the impoundment because it is situated at the high point of the impoundment.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

No regulating procedures are known to exist for this structure.

4.2 MAINTENANCE OF DAM

Information available to the inspection team indicates that the dam is not regularly maintained.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities at this dam. Not applicable.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

Information available to the inspection team indicates that there is no warning system for this dam.

4.5 EVALUATION

The behavior of the dam should be monitored periodically to observe any indications of instability, such as cracks in the dam, sloughing, sudden settlement, erosion of the dam, an increase in the quantity or turbidity of seepage, or piping in or near the dam. A maintenance program should be initiated for this embankment and the diversion ditches.

SECTION 5 - HYDRAULIC AND HYDROLOGIC ANALYSES

5.1 EVALUATION OF FEATURES

a. Design Data. The significant dimensions of the dam are presented in Section 1 - Project Information and in the field survey drawings, Plates 3 through 5. Hydrologic and hydraulic design information is not available.

For this evaluation, the reservoir area-elevation data were obtained using a 1971 U.S. Agricultural Stabilization and Conservation Service airphoto enlargement and the survey data.

The tailings impoundment is completely enclosed by the embankment (see description presented in Section 1.3.a). The total enclosed area inside the embankment is approximately 36 acres (0.056 square mile). The location and boundary are shown on Plate 2. Field surveys indicate that the tailings surface elevation is variable (see Plate 3). To obtain the active storage capacity, the spot elevations on the tailings were transferred to the aerial photograph and used as a guide to develop contours of the tailings surface.

For computations of "basin" characteristics, a lag time of 0.1-hour, and a runoff curve number (CN) of 100 were assumed for the computations of flood runoff for the tailings within the impoundment.

The input data and computed parameters, such as basin lag time, unit hydrograph, probable maximum precipitation, and the reservoir elevation-area-capacity data are in Appendix A. The capacities were calculated by the conic method in the computer program, and are the active capacities at a given elevation. No spillway is present at the damsite. The pipe in the embankment at Sta. 32+06, with an invert at El. 921.6, is about 5 feet higher than the minimum dam crest (El. 916.5). Thus, the pipe would be non-functional. Computations of the discharge rating curve for flows over the dam crest were made by using the weir flow formula with a weir coefficient of 2.7 for the dam crest. The discharge rating curve for flows over the dam crest is in Appendix A, under the input data listing on the Y4 and Y5 cards. The effective crest elevation for overtopping was assumed to be at El. 916.5, the lowest point along the dam crest, at about Sta. 2+50 to Sta. 3+50 (see Section 1.3). Overtopping could also occur at higher water surface elevations at about Sta. 46+00.

b. Experience Data. Rainfall, streamflow, and flood data for the watershed are not available. There is no available evidence of overtopping of No Name 587 Dam.

c. Visual Observations. Visual observations are discussed in Section 3 - Visual Inspection.

d. Overtopping Potential. The probable maximum flood (PMF), and floods expressed as percentages of PMF were computed and routed through the reservoir. The probable maximum flood is defined as the flood event that would result from the most severe combination of critical meteorologic and hydrologic conditions that is reasonably possible at a particular location or region.

The computed floods were routed through the reservoir using the Modified Puls Method of flood routing. For all cases of reservoir flood routing, the starting water surface was set at El. 914.0. This corresponds to one foot of active water storage above the bottom of the reservoir, which was assumed to be the antecedent condition prior to the occurence of floods. Results of the overtopping analyses indicate that the dam cannot retain the 50 percent PMF without overtopping the minimum dam crest. Results also indicate that it is marginal whether or not the dam can store the 14 percent PMF without overtopping.

The 100-year flood and 10-year flood were computed and routed through the reservoir in the same manner as discussed above. Results of the overtopping analyses indicate that the dam cannot store the 100-year flood and it is marginal whether or not the dam can store the 10-year flood without overtopping the dam crest. The overtopping location is at about Sta. 2+00 to Sta. 4+00, the lowest point of the embankment (El. 916.5).

Results of the overtopping analyses are reported in Appendix A and are summarized below.

Flood	Peak Inflow (cfs)	Peak Outflow (cfs)	Max WS Elev (ft)	Max Depth Over Min. Dam Crest (ft)	Duration Overtopped (hrs)
10-year	157	5	916.51*	0.01	9.5
100-year	226	62	916.63*	0.13	11.8
13% PMF	109	0	916.48	0	0
14% PMF	117	7	916.51*	0.01	6.2
15% PMF	125	16	916.53*	0.03	7.0
50% PMF	418	246	917.01*	0.51	10.8
PMF	836	687	917.28*	0.78	13.8

* Dam overtopped (Minimum Dam Crest El. 916.5).

Note: Water surface elevations include the velocity heads corresponding to the velocities computed for the various flow depths for the overtopping section.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Conditions that may adversely affect the structural stability of this dam are discussed in Section 3.

b. Design and Construction Data. No design or construction data pertaining to the structural stability of the dam were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, and this lack of information is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions, including earthquake loads, and should be made a matter of record.

c. Operating Records. No appurtenant structures requiring operation exist at this dam and no records of operation are known to exist.

d. Post-Construction Changes. The only apparent post-construction change is the excavation of embankment gravels from the northeast corner and possibly from the west side of the impoundment.

e. Seismic Stability. The dam is located in Seismic Zone 2, as defined in the Uniform Building Code. Some crest settlement and ravelling of the gravels could occur during seismic shaking because the gravels are loose and the downstream slopes are at or near the natural angle of repose.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. There are several deficiencies that should be corrected. (1) The slope adjacent to the upstream pond has no erosion protection. (2) Excavation of gravels from the dam is causing a reduction in available freeboard. (3) The foundation soils along the north side and at the northeast corner of the impoundment are being undercut by flow through the diversion ditch and by flow through Rubeneau Branch, respectively. (4) The ground surface at the seep (Station 21+80) is soft and could adversely affect embankment stability. (5) It was estimated that the impoundment cannot retain 50 percent of the Probable Maximum Flood (PMF) without overtopping the dam. The PMF is the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that is reasonably possible in the region. As an intermediate size dam with a high hazard potential, the "Recommended Guidelines for Safety Inspection of Dams" specify that the discharge capacity and/or storage capacity should be capable of safely handling the PMF without overtopping. (6) Seepage and stability analyses were not available, and they should be made a matter of record.

b. Adequacy of Information. No detailed design or construction data were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, and this lack of information is considered a deficiency.

Results of the hydrologic studies could be changed if larger scale topographic maps with smaller contour intervals were used. The only available topographic maps are the 7.5-minute, 1:24,000 scale USGS quadrangles with 20-foot contour intervals. No topographical information for the tailings impoundment surface exists on these quadrangles. Approximate contours of the tailings surface were generated using the survey data (Plate 3) and an aerial photograph (scale: 1 inch = 660 feet). The use of the survey data and aerial photograph for the hydrologic studies results in an approximate evaluation of the flood storage capacity.

c. Urgency. The Phase I inspection indicated apparent deficiencies in the condition of the dam. Priority should be given to initiating remedial work to provide adequate discharge capacity and/or storage capacity of the impoundment.

d. Necessity for Phase II. No Phase II investigation is recommended; however, additional investigative work should be done as necessary so that seepage and stability analyses can be performed. The investigations should be undertaken by a professional engineer experienced in the design and construction of tailings dams.

7.2 REMEDIAL MEASURES

The following remedial measures are recommended:

a. Adequate erosion protection should be provided for the embankment slope adjacent to the upstream pond to prevent wave erosion.

b. Adequate erosion protection should be provided in the diversion ditch along the north side of the impoundment and in the Rubeneau Branch diversion along the east side of the impoundment to protect the dam foundation from being eroded. Particular emphasis should be given to the section of the Rubeneau Branch at the northeast corner of the impoundment. This section is steep and is eroding the foundation soils of the embankment.

c. The excavation of gravels from the dam should be stopped. This activity is decreasing the available freeboard and the ability of the embankment to retain floodwater. The excavated areas should be repaired under the direction of a professional engineer experienced in tailings dam design and construction.

d. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of tailings dams. The embankment is a relatively porous granular structure above the tailings surface. If the impoundment water level were to rise above the tailings surface, there could be significant seepage through the embankment which could adversely affect the stability of the dam. Included in these analyses, therefore, seepage and stability computations should also be performed with the reservoir water surface set at the top of the dam. Based on the results of the stability studies, remedial measures may become necessary. Remedial work should be done under the direction of a professional engineer experienced in tailings dam design and construction.

e. Adequate sub-drainage should be provided at any seep location.

f. Results of the hydraulic and hydrologic analyses indicate that it is marginal whether or not the dam can store 14 percent of the PMF without overtopping the dam crest. To comply with the Guidelines for a dam of this size and hazard potential, adequate overflow facilities and/or freeboard should be provided so that the impoundment can handle the PMF without overtopping the crest and without significant erosion of the embankment. Also, the crest width should be sufficient so that when floodwater rises within the impoundment, adequate stability can be maintained.

g. Further studies may indicate the feasibility of other alternatives to providing adequate overflow facilities and freeboard to handle the PMF. For example, consideration could be given to grading the embankment crest gravels level with the tailings surface so that no active storage can exist. In this case, the gravel embankment around the tailings impoundment should be resistant to erosion from sheet flow over the impoundment. These studies should be performed under the direction of an engineer experienced in the design and construction of tailings dams.

h. An inspection and maintenance program should be initiated. Periodic inspections should be made by qualified personnel to observe the performance of the dam and diversion ditches. Observations should include indications of instability, such as cracks in the embankment, sloughing, erosion, sudden settlement, or an increase in the volume or turbidity of seepage areas. Records should be kept of these inspections and of any corrective maintenance made to the dam and diversion ditches.

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSES

The hydrologic and hydraulic analyses were accomplished by using the computer program "Flood Hydrograph Package, HEC-1, Dam Safety Investigations Version, July 1978". This program was developed by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The criteria and methodology used are briefly discussed below:

- Probable Maximum Precipitation (PMP) - The 24-hour PMP was obtained from Hydrometeorological Report No. 33. The 6-hour and the 1-hour depth-duration distributions followed Corps of Engineers EM 1110-2-1411 criteria.

- 100-year and/or 10-year storms - The 24-hour storm amounts and distributions were supplied by Corps of Engineers, St. Louis District, Missouri.

- Reservoir Area-Capacity - Areas were measured from U.S.G.S. topographic maps and/or from aerial photographs. Reservoir elevations and corresponding surface areas were input in the computer program, which determined the reservoir capacities by the Conic Method.

- Flood Routing - The Modified Puls Method was used for all flood routing and dam overtopping analyses.

The following pages present the input data listing, the computer program version and its last modification date, together with pertinent computer printouts of results. Definitions of all input and output variable names are presented in the September 1978 computer program "Users Manual", and are not explained herein.

```
A1          NO NAME 587 DAM, ID NO 30753
A2          HEC-1  PHASE 1  DAM SAFETY INVESTIGATIONS
A3          RATIOS OF PMF ROUTED THROUGH RESERVOIR
B     288                   5
B1      5
J       1         5         1
J1    .13       .14       .15       .50       1.0
K       0   INFLOW                              1         1
K1    PMF  INFLOW TO CLOSED SYSTEM
M       1         2     .0563                             1                              1
P       0      26.5       102       120       130
T                                                                    -1      -100
W2                .1
X     -.01      -.01       1.0
K       1    LAKE                                1         1         1
K1  ROUTING THROUGH CLOSED SYSTEM
Y                                               1         1
Y1      1                                                          -914        -1
Y4    913     916.5     917.1     917.5     917.6     918.0     918.2     918.5     918.8       919
Y5      0      .001       290      1170      1534      3030      4243      6010      8284      9720
$A      0         2         4         7        10        13        18        27        34
$E    913       914       915       916     916.5       917     917.5       918       919
$S  916.5
$D  916.5
K      99
A
A
A
A
A
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 79/07/31.
     TIME= 14.50.53.
```

NO NAME 587 DAM, ID NO 30753
HEC-1 PHASE 1 DAM SAFETY INVESTIGATIONS
RATIOS OF PMF ROUTED THROUGH RESERVOIR

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .13 .14 .15 .50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

PMF INFLOW TO CLOSED SYSTEM

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW		0	0	0	1	1	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	IRSDA	IRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.06	0.00	.06	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.50	102.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-100.00	0.00	0.00

CURVE NO = -100.00 WETNESS = -1.00 EFFECT CN = 100.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .10

RECESSION DATA
STRTQ= -.01 QRCSN= -.01 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 8 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .10 VOL= 1.00

123. 182. 80. 31. 12. 5. 2. 1.

Q MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.01	0.00	2.	1.01	12.05	145	.23	.23	.00	48.
1.01	.10	2	.01	.01	0.00	4.	1.01	12.10	146	.23	.23	.00	77.
1.01	.15	3	.01	.01	.00	6.	1.01	12.15	147	.23	.23	.00	90.
1.01	.20	4	.01	.01	-.00	6.	1.01	12.20	148	.23	.23	.00	95.
1.01	.25	5	.01	.01	-.00	6.	1.01	12.25	149	.23	.23	-.00	97.
1.01	.30	6	.01	.01	-.00	6.	1.01	12.30	150	.23	.23	.00	98.
1.01	.35	7	.01	.01	-.00	6.	1.01	12.35	151	.23	.23	.00	98.
1.01	.40	8	.01	.01	-.00	6.	1.01	12.40	152	.23	.23	-.00	98.
1.01	.45	9	.01	.01	.00	6.	1.01	12.45	153	.23	.23	.00	98.
1.01	.50	10	.01	.01	.00	6.	1.01	12.50	154	.23	.23	.00	98.
1.01	.55	11	.01	.01	.00	6.	1.01	12.55	155	.23	.23	-.00	98.
1.01	1.00	12	.01	.01	.00	6.	1.01	13.00	156	.23	.23	-.00	98.
1.01	1.05	13	.01	.01	.00	6.	1.01	13.05	157	.27	.27	-.00	104.
1.01	1.10	14	.01	.01	-.00	6.	1.01	13.10	158	.27	.27	-.00	112.
1.01	1.15	15	.01	.01	.00	6.	1.01	13.15	159	.27	.27	-.00	116.
1.01	1.20	16	.01	.01	-.00	6.	1.01	13.20	160	.27	.27	-.00	117.
1.01	1.25	17	.01	.01	.00	6.	1.01	13.25	161	.27	.27	-.00	117.
1.01	1.30	18	.01	.01	.00	6.	1.01	13.30	162	.27	.27	-.00	118.
1.01	1.35	19	.01	.01	.00	6.	1.01	13.35	163	.27	.27	-.00	118.
1.01	1.40	20	.01	.01	.00	6.	1.01	13.40	164	.27	.27	-.00	118.
1.01	1.45	21	.01	.01	.00	6.	1.01	13.45	165	.27	.27	-.00	118.
1.01	1.50	22	.01	.01	.00	6.	1.01	13.50	166	.27	.27	-.00	118.
1.01	1.55	23	.01	.01	-.00	6.	1.01	13.55	167	.27	.27	-.00	118.
1.01	2.00	24	.01	.01	.00	6.	1.01	14.00	168	.27	.27	.00	118.
1.01	2.05	25	.01	.01	.00	6.	1.01	14.05	169	.34	.34	-.00	126.
1.01	2.10	26	.01	.01	.00	6.	1.01	14.10	170	.34	.34	.00	138.
1.01	2.15	27	.01	.01	-.00	6.	1.01	14.15	171	.34	.34	-.00	144.
1.01	2.20	28	.01	.01	.00	6.	1.01	14.20	172	.34	.34	.00	146.
1.01	2.25	29	.01	.01	.00	6.	1.01	14.25	173	.34	.34	-.00	147.
1.01	2.30	30	.01	.01	-.00	6.	1.01	14.30	174	.34	.34	.00	147.
1.01	2.35	31	.01	.01	.00	6.	1.01	14.35	175	.34	.34	.00	147.
1.01	2.40	32	.01	.01	.00	6.	1.01	14.40	176	.34	.34	.00	147.
1.01	2.45	33	.01	.01	-.00	6.	1.01	14.45	177	.34	.34	.00	147.
1.01	2.50	34	.01	.01	.00	6.	1.01	14.50	178	.34	.34	.00	147.
1.01	2.55	35	.01	.01	.00	6.	1.01	14.55	179	.34	.34	-.00	147.
1.01	3.00	36	.01	.01	.00	6.	1.01	15.00	180	.34	.34	.00	147.
1.01	3.05	37	.01	.01	.00	6.	1.01	15.05	181	.21	.21	.00	131.
1.01	3.10	38	.01	.01	.00	6.	1.01	15.10	182	.41	.41	.00	132.
1.01	3.15	39	.01	.01	.00	6.	1.01	15.15	183	.41	.41	.00	159.
1.01	3.20	40	.01	.01	.00	6.	1.01	15.20	184	.62	.62	.00	197.
1.01	3.25	41	.01	.01	.00	6.	1.01	15.25	185	.72	.72	-.00	252.
1.01	3.30	42	.01	.01	.00	6.	1.01	15.30	186	1.75	1.75	.00	415.
1.01	3.35	43	.01	.01	-.00	6.	1.01	15.35	187	2.88	2.88	-.00	757.
1.01	3.40	44	.01	.01	.00	6.	1.01	15.40	188	1.13	1.13	.00	836.
1.01	3.45	45	.01	.01	.00	6.	1.01	15.45	189	.72	.72	-.00	592.
1.01	3.50	46	.01	.01	.00	6.	1.01	15.50	190	.62	.62	-.00	413.
1.01	3.55	47	.01	.01	.00	6.	1.01	15.55	191	.41	.41	.00	300.
1.01	4.00	48	.01	.01	.00	6.	1.01	16.00	192	.41	.41	-.00	228.
1.01	4.05	49	.01	.01	.00	6.	1.01	16.05	193	.32	.32	.00	186.
1.01	4.10	50	.01	.01	-.00	6.	1.01	16.10	194	.32	.32	.00	156.
1.01	4.15	51	.01	.01	.00	6.	1.01	16.15	195	.32	.32	.00	144.
1.01	4.20	52	.01	.01	.00	6.	1.01	16.20	196	.32	.32	.00	140.
1.01	4.25	53	.01	.01	.00	6.	1.01	16.25	197	.32	.32	-.00	138.
1.01	4.30	54	.01	.01	-.00	6.	1.01	16.30	198	.32	.32	.00	138.
1.01	4.35	55	.01	.01	.00	6.	1.01	16.35	199	.32	.32	.00	137.

1.01	4.40	56	.01	.01	.00	6.	1.01	16.40	200	.32	.32	.00	137.
1.01	4.45	57	.01	.01	.00	6.	1.01	16.45	201	.32	.32	-.00	137.
1.01	4.50	58	.01	.01	-.00	6.	1.01	16.50	202	.32	.32	.00	137.
1.01	4.55	59	.01	.01	.00	6.	1.01	16.55	203	.32	.32	-.00	137.
1.01	5.00	60	.01	.01	.00	6.	1.01	17.00	204	.32	.32	.00	137.
1.01	5.05	61	.01	.01	.00	6.	1.01	17.05	205	.25	.25	.00	129.
1.01	5.10	62	.01	.01	-.00	6.	1.01	17.10	206	.25	.25	-.00	117.
1.01	5.15	63	.01	.01	.00	6.	1.01	17.15	207	.25	.25	-.00	111.
1.01	5.20	64	.01	.01	.00	6.	1.01	17.20	208	.25	.25	.00	109.
1.01	5.25	65	.01	.01	-.00	6.	1.01	17.25	209	.25	.25	-.00	108.
1.01	5.30	66	.01	.01	.00	6.	1.01	17.30	210	.25	.25	.00	108.
1.01	5.35	67	.01	.01	.00	6.	1.01	17.35	211	.25	.25	-.00	108.
1.01	5.40	68	.01	.01	.00	6.	1.01	17.40	212	.25	.25	-.00	108.
1.01	5.45	69	.01	.01	-.00	6.	1.01	17.45	213	.25	.25	.00	108.
1.01	5.50	70	.01	.01	-.00	6.	1.01	17.50	214	.25	.25	-.00	108.
1.01	5.55	71	.01	.01	-.00	6.	1.01	17.55	215	.25	.25	-.00	108.
1.01	6.00	72	.01	.01	-.00	6.	1.01	18.00	216	.25	.25	-.00	108.
1.01	6.05	73	.07	.07	.00	13.	1.01	18.05	217	.02	.02	.00	80.
1.01	6.10	74	.07	.07	.00	22.	1.01	18.10	218	.02	.02	.00	39.
1.01	6.15	75	.07	.07	.00	26.	1.01	18.15	219	.02	.02	.00	21.
1.01	6.20	76	.07	.07	.00	28.	1.01	18.20	220	.02	.02	.00	14.
1.01	6.25	77	.07	.07	.00	29.	1.01	18.25	221	.02	.02	.00	11.
1.01	6.30	78	.07	.07	.00	29.	1.01	18.30	222	.02	.02	.00	10.
1.01	6.35	79	.07	.07	.00	29.	1.01	18.35	223	.02	.02	.00	10.
1.01	6.40	80	.07	.07	.00	29.	1.01	18.40	224	.02	.02	.00	10.
1.01	6.45	81	.07	.07	-.00	29.	1.01	18.45	225	.02	.02	.00	10.
1.01	6.50	82	.07	.07	.00	29.	1.01	18.50	226	.02	.02	.00	10.
1.01	6.55	83	.07	.07	.00	29.	1.01	18.55	227	.02	.02	-.00	10.
1.01	7.00	84	.07	.07	.00	29.	1.01	19.00	228	.02	.02	.00	10.
1.01	7.05	85	.07	.07	-.00	29.	1.01	19.05	229	.02	.02	.00	10.
1.01	7.10	86	.07	.07	.00	29.	1.01	19.10	230	.02	.02	.00	10.
1.01	7.15	87	.07	.07	.00	29.	1.01	19.15	231	.02	.02	.00	10.
1.01	7.20	88	.07	.07	.00	29.	1.01	19.20	232	.02	.02	.00	10.
1.01	7.25	89	.07	.07	.00	29.	1.01	19.25	233	.02	.02	.00	10.
1.01	7.30	90	.07	.07	.00	29.	1.01	19.30	234	.02	.02	-.00	10.
1.01	7.35	91	.07	.07	.00	29.	1.01	19.35	235	.02	.02	.00	10.
1.01	7.40	92	.07	.07	.00	29.	1.01	19.40	236	.02	.02	.00	10.
1.01	7.45	93	.07	.07	.00	29.	1.01	19.45	237	.02	.02	-.00	10.
1.01	7.50	94	.07	.07	.00	29.	1.01	19.50	238	.02	.02	.00	10.
1.01	7.55	95	.07	.07	.00	29.	1.01	19.55	239	.02	.02	.00	10.
1.01	8.00	96	.07	.07	.00	29.	1.01	20.00	240	.02	.02	.00	10.
1.01	8.05	97	.07	.07	.00	29.	1.01	20.05	241	.02	.02	.00	10.
1.01	8.10	98	.07	.07	-.00	29.	1.01	20.10	242	.02	.02	.00	10.
1.01	8.15	99	.07	.07	.00	29.	1.01	20.15	243	.02	.02	.00	10.
1.01	8.20	100	.07	.07	.00	29.	1.01	20.20	244	.02	.02	.00	10.
1.01	8.25	101	.07	.07	-.00	29.	1.01	20.25	245	.02	.02	.00	10.
1.01	8.30	102	.07	.07	.00	29.	1.01	20.30	246	.02	.02	.00	10.
1.01	8.35	103	.07	.07	.00	29.	1.01	20.35	247	.02	.02	.00	10.
1.01	8.40	104	.07	.07	-.00	29.	1.01	20.40	248	.02	.02	.00	10.
1.01	8.45	105	.07	.07	.00	29.	1.01	20.45	249	.02	.02	.00	10.
1.01	8.50	106	.07	.07	-.00	29.	1.01	20.50	250	.02	.02	.00	10.
1.01	8.55	107	.07	.07	.00	29.	1.01	20.55	251	.02	.02	.00	10.
1.01	9.00	108	.07	.07	.00	29.	1.01	21.00	252	.02	.02	.00	10.
1.01	9.05	109	.07	.07	.00	29.	1.01	21.05	253	.02	.02	.00	10.
1.01	9.10	110	.07	.07	.00	29.	1.01	21.10	254	.02	.02	.00	10.
1.01	9.15	111	.07	.07	.00	29.	1.01	21.15	255	.02	.02	.00	10.
1.01	9.20	112	.07	.07	-.00	29.	1.01	21.20	256	.02	.02	.00	10.
1.01	9.25	113	.07	.07	.00	29.	1.01	21.25	257	.02	.02	-.00	10.
1.01	9.30	114	.07	.07	-.00	29.	1.01	21.30	258	.02	.02	.00	10.
1.01	9.35	115	.07	.07	.00	29.	1.01	21.35	259	.02	.02	-.00	10.

1.01	9.40	116	.07	.07	.00	29.	1.01	21.40	260	.02	.02	.00	10.
1.01	9.45	117	.07	.07	.00	29.	1.01	21.45	261	.02	.02	.00	10.
1.01	9.50	118	.07	.07	.00	29.	1.01	21.50	262	.02	.02	-.00	10.
1.01	9.55	119	.07	.07	.00	29.	1.01	21.55	263	.02	.02	.00	10.
1.01	10.00	120	.07	.07	.00	29.	1.01	22.00	264	.02	.02	.00	10.
1.01	10.05	121	.07	.07	-.00	29.	1.01	22.05	265	.02	.02	.00	10.
1.01	10.10	122	.07	.07	.00	29.	1.01	22.10	266	.02	.02	.00	10.
1.01	10.15	123	.07	.07	-.00	29.	1.01	22.15	267	.02	.02	.00	10.
1.01	10.20	124	.07	.07	.00	29.	1.01	22.20	268	.02	.02	.00	10.
1.01	10.25	125	.07	.07	.00	29.	1.01	22.25	269	.02	.02	.00	10.
1.01	10.30	126	.07	.07	.00	29.	1.01	22.30	270	.02	.02	-.00	10.
1.01	10.35	127	.07	.07	-.00	29.	1.01	22.35	271	.02	.02	.00	10.
1.01	10.40	128	.07	.07	.00	29.	1.01	22.40	272	.02	.02	.00	10.
1.01	10.45	129	.07	.07	.00	29.	1.01	22.45	273	.02	.02	.00	10.
1.01	10.50	130	.07	.07	.00	29.	1.01	22.50	274	.02	.02	.00	10.
1.01	10.55	131	.07	.07	.00	29.	1.01	22.55	275	.02	.02	.00	10.
1.01	11.00	132	.07	.07	.00	29.	1.01	23.00	276	.02	.02	-.00	10.
1.01	11.05	133	.07	.07	.00	29.	1.01	23.05	277	.02	.02	.00	10.
1.01	11.10	134	.07	.07	.00	29.	1.01	23.10	278	.02	.02	.00	10.
1.01	11.15	135	.07	.07	.00	29.	1.01	23.15	279	.02	.02	.00	10.
1.01	11.20	136	.07	.07	.00	29.	1.01	23.20	280	.02	.02	.00	10.
1.01	11.25	137	.07	.07	.00	29.	1.01	23.25	281	.02	.02	.00	10.
1.01	11.30	138	.07	.07	.00	29.	1.01	23.30	282	.02	.02	.00	10.
1.01	11.35	139	.07	.07	.00	29.	1.01	23.35	283	.02	.02	.00	10.
1.01	11.40	140	.07	.07	-.00	29.	1.01	23.40	284	.02	.02	.00	10.
1.01	11.45	141	.07	.07	.00	29.	1.01	23.45	285	.02	.02	.00	10.
1.01	11.50	142	.07	.07	.00	29.	1.01	23.50	286	.02	.02	.00	10.
1.01	11.55	143	.07	.07	.00	29.	1.01	23.55	287	.02	.02	.00	10.
1.01	12.00	144	.07	.07	.00	29.	1.02	0.00	288	.02	.02	.00	10.
									SUM	34.45	34.45	.00	15003.
										(875.)(	875.)(	0.)(	424.84)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	836.	162.	52.	52.	14995.
CMS	24.	5.	1.	1.	425.
INCHES		26.85	34.41	34.41	34.41
MM		681.97	874.03	874.03	874.03
AC-FT		81.	103.	103.	103.
THOUS CU M		99.	127.	127.	127.

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HYDROGRAPH ROUTING

ROUTING THROUGH CLOSED SYSTEM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	1	0	0	1	1	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-914.	-1

STAGE	913.00	916.50	917.10	917.50	917.60	918.00	918.20	918.50	918.80	919.00
FLOW	0.00	.00	290.00	1170.00	1534.00	3030.00	4243.00	6010.00	8284.00	9720.00
SURFACE AREA=	0.	2.	4.	7.	10.	13.	18.	27.	34.	
CAPACITY=	0.	1.	4.	9.	13.	19.	27.	38.	68.	
ELEVATION=	913.	914.	915.	916.	917.	917.	918.	918.	919.	

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
916.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
916.5	0.0	0.0	0.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .13	RATIO 2 .14	RATIO 3 .15	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	INFLOW	.06	1	109.	117.	125.	418.	836.
	(	.15)	(	3.08)(	3.31)(	3.55)(	11.84)(	23.68)(
ROUTED TO	LAKE	.06	1	0.	7.	16.	246.	687.
	(	.15)	(	.00)(	.20)(	.44)(	6.96)(	19.45)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	918.00	916.50	916.50
STORAGE	1.	13.	13.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.13	916.48	0.00	13.	0.	0.00	24.00	0.00
.14	916.51	.01	13.	7.	6.17	18.17	0.00
.15	916.53	.03	14.	16.	7.00	18.00	0.00
.50	917.01	.51	19.	246.	10.83	15.83	0.00
1.00	917.28	.78	23.	687.	13.83	15.75	0.00

```
A1          NO NAME 587 DAM, ID NO 30753
A2          HEC-1  PHASE 1 DAM SAFETY INVESTIGATION
A3          100-YR ROUTING THROUGH CLOSED SYSTEM
B     144                 10
B1      3
K       0  INFLOW                                    1        1
K1    100-YR FLOOD TO CLOSED SYSTEM
M       0         2  0.0563
O     144
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014     .014     .014     .028     .028     .028     .028
O1  .028     .028     .028     .028     .028     .028     .028     .028     .028     .028
O1  .028     .028     .028     .028     .044     .044     .044     .044     .044     .044
O1  .044     .044     .044     .062     .062     .062     .122     .122     .122     .264
O1  .384     .801    1.205     .384     .264     .122     .122     .122     .062     .062
O1  .062     .044     .044     .044     .044     .044     .044     .044     .044     .044
O1  .028     .028     .028     .028     .028     .028     .028     .028     .028     .028
O1  .028     .028     .028     .028     .028     .028     .028     .028     .014     .014
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014     .014     .014     .014     .014     .014     .014
O1  .014     .014     .014     .014
T                                                        -1     -100
W2            0.1
X   -.01     -.01        1
K       1     POND                                    1        1
K1    ROUTING THROUGH CLOSED SYSTEM
Y                                          1        1
Y1      1                                                -914       -1
Y4    913    916.5    917.1    917.5    917.6    918.0    918.2    918.5    918.8      919
Y5      0     .001      290     1170     1534     3030     4243     6010     8284     9720
SA      0        2        4        7       10       13       18       27       34
SE    913      914      915      916    916.5      917    917.5      918      919
SS  916.5
SD  916.5
K      99
A
```

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 79/08/01.
     TIME= 11.49.14.
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NO NAME SR7 DAM, ID NO 30753
HEC-1 PHASE I DAM SAFETY INVESTIGATION
100-YR ROUTING THROUGH CLOSED SYSTEM

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			3	0	0	0			

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SUB-AREA RUNOFF COMPUTATION

100-YR FLOOD TO CLOSED SYSTEM

	ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	INFLOW	0	0	0	0	1	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.06	0.00	.06	0.00	0.000	0	0	0

PRECIP DATA

	NP	STORM	DAJ	DAK
	100	0.00	0.00	0.00

PRECIP PATTERN

.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.04	.04	.04	.04	.04	.04
.04	.04	.04	.06	.06	.06	.12	.12	.12	.26
.38	.80	1.21	.38	.26	.12	.12	.12	.06	.06
.06	.04	.04	.04	.04	.04	.04	.04	.04	.04
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01						

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-100.00	0.00	0.00

CURVE NO = -100.00 WETNESS = -1.00 EFFECT CN = 100.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .10

RECESSION DATA
STRTQ= -.01 QRCSN= -.01 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .10 VOL= 1.00
146. 56. 13. 3. 1.

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.01	.01	.00	2.	1.01	12.10	73	1.21	1.21	.00	226.
1.01	.20	2	.01	.01	.00	3.	1.01	12.20	74	.38	.38	-.00	135.
1.01	.30	3	.01	.01	0.00	3.	1.01	12.30	75	.26	.26	-.00	78.
1.01	.40	4	.01	.01	.00	3.	1.01	12.40	76	.12	.12	-.00	42.
1.01	.50	5	.01	.01	.00	3.	1.01	12.50	77	.12	.12	-.00	30.
1.01	1.00	6	.01	.01	-.00	3.	1.01	13.00	78	.12	.12	-.00	27.
1.01	1.10	7	.01	.01	-.00	3.	1.01	13.10	79	.06	.06	-.00	18.
1.01	1.20	8	.01	.01	-.00	3.	1.01	13.20	80	.06	.06	.00	15.
1.01	1.30	9	.01	.01	.00	3.	1.01	13.30	81	.06	.06	-.00	14.
1.01	1.40	10	.01	.01	-.00	3.	1.01	13.40	82	.04	.04	.00	11.
1.01	1.50	11	.01	.01	-.00	3.	1.01	13.50	83	.04	.04	-.00	10.
1.01	2.00	12	.01	.01	-.00	3.	1.01	14.00	84	.04	.04	-.00	10.
1.01	2.10	13	.01	.01	.00	3.	1.01	14.10	85	.04	.04	.00	10.
1.01	2.20	14	.01	.01	-.00	3.	1.01	14.20	86	.04	.04	-.00	10.
1.01	2.30	15	.01	.01	-.00	3.	1.01	14.30	87	.04	.04	.00	10.
1.01	2.40	16	.01	.01	-.00	3.	1.01	14.40	88	.04	.04	-.00	10.
1.01	2.50	17	.01	.01	-.00	3.	1.01	14.50	89	.04	.04	-.00	10.
1.01	3.00	18	.01	.01	.00	3.	1.01	15.00	90	.04	.04	.00	10.
1.01	3.10	19	.01	.01	.00	3.	1.01	15.10	91	.03	.03	-.00	7.
1.01	3.20	20	.01	.01	.00	3.	1.01	15.20	92	.03	.03	.00	6.
1.01	3.30	21	.01	.01	.00	3.	1.01	15.30	93	.03	.03	.00	6.
1.01	3.40	22	.01	.01	.00	3.	1.01	15.40	94	.03	.03	-.00	6.
1.01	3.50	23	.01	.01	.00	3.	1.01	15.50	95	.03	.03	.00	6.
1.01	4.00	24	.01	.01	.00	3.	1.01	16.00	96	.03	.03	.00	6.
1.01	4.10	25	.01	.01	.00	3.	1.01	16.10	97	.03	.03	-.00	6.
1.01	4.20	26	.01	.01	.00	3.	1.01	16.20	98	.03	.03	.00	6.
1.01	4.30	27	.01	.01	.00	3.	1.01	16.30	99	.03	.03	-.00	6.
1.01	4.40	28	.01	.01	.00	3.	1.01	16.40	100	.03	.03	.00	6.
1.01	4.50	29	.01	.01	.00	3.	1.01	16.50	101	.03	.03	.00	6.
1.01	5.00	30	.01	.01	-.00	3.	1.01	17.00	102	.03	.03	.00	6.
1.01	5.10	31	.01	.01	.00	3.	1.01	17.10	103	.03	.03	.00	6.
1.01	5.20	32	.01	.01	-.00	3.	1.01	17.20	104	.03	.03	.00	6.
1.01	5.30	33	.01	.01	.00	3.	1.01	17.30	105	.03	.03	.00	6.
1.01	5.40	34	.01	.01	-.00	3.	1.01	17.40	106	.03	.03	.00	6.
1.01	5.50	35	.01	.01	.00	3.	1.01	17.50	107	.03	.03	-.00	6.
1.01	6.00	36	.01	.01	.00	3.	1.01	18.00	108	.03	.03	.00	6.
1.01	6.10	37	.03	.03	.00	5.	1.01	18.10	109	.01	.01	-.00	4.
1.01	6.20	38	.03	.03	.00	6.	1.01	18.20	110	.01	.01	-.00	3.
1.01	6.30	39	.03	.03	.00	6.	1.01	18.30	111	.01	.01	-.00	3.
1.01	6.40	40	.03	.03	.00	6.	1.01	18.40	112	.01	.01	-.00	3.
1.01	6.50	41	.03	.03	.00	6.	1.01	18.50	113	.01	.01	-.00	3.
1.01	7.00	42	.03	.03	.00	6.	1.01	19.00	114	.01	.01	.00	3.
1.01	7.10	43	.03	.03	.00	6.	1.01	19.10	115	.01	.01	-.00	3.
1.01	7.20	44	.03	.03	.00	6.	1.01	19.20	116	.01	.01	-.00	3.

1.01	7.30	45	.03	.03	.00	6.	1.01	19.30	117	.01	.01	-.00	3.
1.01	7.40	46	.03	.03	-.00	6.	1.01	19.40	118	.01	.01	-.00	3.
1.01	7.50	47	.03	.03	.00	6.	1.01	19.50	119	.01	.01	-.00	3.
1.01	8.00	48	.03	.03	.00	6.	1.01	20.00	120	.01	.01	.00	3.
1.01	8.10	49	.03	.03	.00	6.	1.01	20.10	121	.01	.01	-.00	3.
1.01	8.20	50	.03	.03	-.00	6.	1.01	20.20	122	.01	.01	.00	3.
1.01	8.30	51	.03	.03	.00	6.	1.01	20.30	123	.01	.01	-.00	3.
1.01	8.40	52	.03	.03	.00	6.	1.01	20.40	124	.01	.01	-.00	3.
1.01	8.50	53	.03	.03	.00	6.	1.01	20.50	125	.01	.01	.00	3.
1.01	9.00	54	.03	.03	.00	6.	1.01	21.00	126	.01	.01	-.00	3.
1.01	9.10	55	.04	.04	.00	8.	1.01	21.10	127	.01	.01	-.00	3.
1.01	9.20	56	.04	.04	.00	9.	1.01	21.20	128	.01	.01	.00	3.
1.01	9.30	57	.04	.04	.00	10.	1.01	21.30	129	.01	.01	-.00	3.
1.01	9.40	58	.04	.04	.00	10.	1.01	21.40	130	.01	.01	-.00	3.
1.01	9.50	59	.04	.04	.00	10.	1.01	21.50	131	.01	.01	-.00	3.
1.01	10.00	60	.04	.04	.00	10.	1.01	22.00	132	.01	.01	-.00	3.
1.01	10.10	61	.04	.04	.00	10.	1.01	22.10	133	.01	.01	.00	3.
1.01	10.20	62	.04	.04	.00	10.	1.01	22.20	134	.01	.01	-.00	3.
1.01	10.30	63	.04	.04	.00	10.	1.01	22.30	135	.01	.01	-.00	3.
1.01	10.40	64	.06	.06	.00	12.	1.01	22.40	136	.01	.01	-.00	3.
1.01	10.50	65	.06	.06	-.00	13.	1.01	22.50	137	.01	.01	-.00	3.
1.01	11.00	66	.06	.06	.00	13.	1.01	23.00	138	.01	.01	.00	3.
1.01	11.10	67	.12	.12	0.00	22.	1.01	23.10	139	.01	.01	-.00	3.
1.01	11.20	68	.12	.12	0.00	26.	1.01	23.20	140	.01	.01	-.00	3.
1.01	11.30	69	.12	.12	.00	26.	1.01	23.30	141	.01	.01	.00	3.
1.01	11.40	70	.26	.26	.00	47.	1.01	23.40	142	.01	.01	-.00	3.
1.01	11.50	71	.38	.38	-.00	71.	1.01	23.50	143	.01	.01	-.00	3.
1.01	12.00	72	.80	.80	-.00	142.	1.02	0.00	144	.01	.01	.00	3.
									SUM	7.21	7.21	.00	1569.
										(183.)(	183.)(	0.)(	44.43)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	226.	31.	11.	11.	1568.
CMS	6.	1.	0.	0.	44.
INCHES		5.19	7.20	7.20	7.20
MM		131.79	182.80	182.80	182.80
AC-FT		16.	22.	22.	22.
THOUS CU M		19.	27.	27.	27.

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HYDROGRAPH ROUTING

ROUTING THROUGH CLOSED SYSTEM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
POND	1	0	0	0	1	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-914.	-1

STAGE	913.00	916.50	917.10	917.50	917.60	918.00	918.20	918.50	918.80	919.00
FLOW	0.00	.00	290.00	1170.00	1534.00	3030.00	4243.00	6010.00	8284.00	9720.00
SURFACE AREA=	0.	2.	4.	7.	10.	13.	18.	27.	34.	
CAPACITY=	0.	1.	4.	9.	13.	19.	27.	38.	68.	
ELEVATION=	913.	914.	915.	916.	917.	917.	918.	918.	919.	

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
916.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COWD	EXPD	DAMWID
916.5	0.0	0.0	0.

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	INFLOW	226.	31.	11.	11.	.06
	(	6.40)(	.89)(	.31)(	.31)(	.15)
ROUTED TO	POND	62.	15.	5.	5.	.06
	(	1.75)(	.42)(	.13)(	.13)(	.15)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN .100-year....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	914.00	916.50	916.50
STORAGE	1.	13.	13.
OUTFLOW	0.	0.	0.

MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
916.63	.13	15.	62.	11.83	12.50	0.00

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A1          NO NAME 587 DAM, ID NO 30753
A2          HEC-1  PHASE 1 DAM SAFETY INVESTIGATION
A3          10-YR ROUTING THROUGH CLOSED SYSTEM
B     144                   10
B1      3
K       0  INFLOW                                    1        1
K1     10-YR FLOOD TO CLOSED SYSTEM, SULLIVAN PRECIP., 10 MIN INTERVAL
M       0         2  0.0563
O     144
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01       .01       .01       .02       .02       .02       .02
O1    .02       .02       .02       .02       .02       .02       .02       .02       .02       .02
O1    .02       .02       .02       .02       .03       .03       .03       .03       .03       .03
O1    .03       .03       .03       .062      .062      .062      .098      .098      .098      .172
O1   .249      .538      .846      .249      .172      .098      .098      .098      .062      .062
O1   .062       .03       .03       .03       .03       .03       .03       .03       .03       .03
O1    .02       .02       .02       .02       .02       .02       .02       .02       .02       .02
O1    .02       .02       .02       .02       .02       .02       .02       .02       .01       .01
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
O1    .01       .01       .01       .01
T                                                                 -1      -100
W2              0.1
X     -.01      -.01         1
K       1      POND                                      1        1
K1    ROUTING OF 10-YR FLOOD THROUGH CLOSED SYSTEM
Y                                          1        1
Y1      1                                                      -914        -1
Y4    913     916.5     917.1     917.5     917.6     918.0     918.2     918.5     918.8       919
Y5      0      .001       290      1170      1534      3030      4243      6010      8284      9720
$A      0         2         4         7        10        13        18        27        34
$E    913       914       915       916     916.5       917     917.5       918       919
$S  916.5
$D  916.5
K      99
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****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 79/07/30.
TIME= 16.38.21.

NC NAME 587 DAM, ID NO 30753
HEC-1 PHASE 1 DAM SAFETY INVESTIGATION
10-YR ROUTING THROUGH CLOSED SYSTEM

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			3	0	0	0			

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SUB-AREA RUNOFF COMPUTATION

10-YR FLOOD TO CLOSED SYSTEM, SULLIVAN PRECIP., 10 MIN INTERVAL

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	INFLOW	0	0	0	0	1	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.06	0.00	.06	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
144	0.00	0.00	0.00

PRECIP PATTERN

.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.02	.02	.02	.02	.03	.03	.03	.03	.03	.03
.03	.03	.03	.06	.06	.06	.10	.10	.10	.17
.25	.54	.85	.25	.17	.10	.10	.10	.06	.06
.06	.03	.03	.03	.03	.03	.03	.03	.03	.03
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01						

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-100.00	0.00	0.00

CURVE NO = -100.00 WETNESS = -1.00 EFFECT CN = 100.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .10

RECESSION DATA
STRTQ= -.01 QRCSN= -.01 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .10 VOL= 1.00
146. 56. 13. 3. 1.

MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.01	.01	0.00	1.	1.01	12.10	73	.85	.85	-.00	157.
1.01	.20	2	.01	.01	0.00	2.	1.01	12.20	74	.25	.25	-.00	91.
1.01	.30	3	.01	.01	0.00	2.	1.01	12.30	75	.17	.17	.00	52.
1.01	.40	4	.01	.01	0.00	2.	1.01	12.40	76	.10	.10	.00	30.
1.01	.50	5	.01	.01	0.00	2.	1.01	12.50	77	.10	.10	.00	23.
1.01	1.00	6	.01	.01	0.00	2.	1.01	13.00	78	.10	.10	.00	22.
1.01	1.10	7	.01	.01	.00	2.	1.01	13.10	79	.06	.06	.00	16.
1.01	1.20	8	.01	.01	-.00	2.	1.01	13.20	80	.06	.06	-.00	14.
1.01	1.30	9	.01	.01	-.00	2.	1.01	13.30	81	.06	.06	-.00	14.
1.01	1.40	10	.01	.01	-.00	2.	1.01	13.40	82	.03	.03	.00	9.
1.01	1.50	11	.01	.01	-.00	2.	1.01	13.50	83	.03	.03	-.00	7.
1.01	2.00	12	.01	.01	-.00	2.	1.01	14.00	84	.03	.03	-.00	7.
1.01	2.10	13	.01	.01	.00	2.	1.01	14.10	85	.03	.03	-.00	7.
1.01	2.20	14	.01	.01	.00	2.	1.01	14.20	86	.03	.03	-.00	7.
1.01	2.30	15	.01	.01	.00	2.	1.01	14.30	87	.03	.03	-.00	7.
1.01	2.40	16	.01	.01	.00	2.	1.01	14.40	88	.03	.03	-.00	7.
1.01	2.50	17	.01	.01	.00	2.	1.01	14.50	89	.03	.03	-.00	7.
1.01	3.00	18	.01	.01	.00	2.	1.01	15.00	90	.03	.03	-.00	7.
1.01	3.10	19	.01	.01	-.00	2.	1.01	15.10	91	.02	.02	-.00	5.
1.01	3.20	20	.01	.01	.00	2.	1.01	15.20	92	.02	.02	-.00	5.
1.01	3.30	21	.01	.01	-.00	2.	1.01	15.30	93	.02	.02	-.00	4.
1.01	3.40	22	.01	.01	.00	2.	1.01	15.40	94	.02	.02	-.00	4.
1.01	3.50	23	.01	.01	.00	2.	1.01	15.50	95	.02	.02	-.00	4.
1.01	4.00	24	.01	.01	-.00	2.	1.01	16.00	96	.02	.02	-.00	4.
1.01	4.10	25	.01	.01	.00	2.	1.01	16.10	97	.02	.02	-.00	4.
1.01	4.20	26	.01	.01	.00	2.	1.01	16.20	98	.02	.02	.00	4.
1.01	4.30	27	.01	.01	-.00	2.	1.01	16.30	99	.02	.02	-.00	4.
1.01	4.40	28	.01	.01	.00	2.	1.01	16.40	100	.02	.02	-.00	4.
1.01	4.50	29	.01	.01	-.00	2.	1.01	16.50	101	.02	.02	-.00	4.
1.01	5.00	30	.01	.01	.00	2.	1.01	17.00	102	.02	.02	.00	4.
1.01	5.10	31	.01	.01	-.00	2.	1.01	17.10	103	.02	.02	-.00	4.
1.01	5.20	32	.01	.01	.00	2.	1.01	17.20	104	.02	.02	-.00	4.
1.01	5.30	33	.01	.01	.00	2.	1.01	17.30	105	.02	.02	-.00	4.
1.01	5.40	34	.01	.01	.00	2.	1.01	17.40	106	.02	.02	-.00	4.
1.01	5.50	35	.01	.01	.00	2.	1.01	17.50	107	.02	.02	.00	4.
1.01	6.00	36	.01	.01	.00	2.	1.01	18.00	108	.02	.02	-.00	4.
1.01	6.10	37	.02	.02	-.00	4.	1.01	18.10	109	.01	.01	.00	3.
1.01	6.20	38	.02	.02	.00	4.	1.01	18.20	110	.01	.01	.00	2.
1.01	6.30	39	.02	.02	-.00	4.	1.01	18.30	111	.01	.01	.00	2.
1.01	6.40	40	.02	.02	.00	4.	1.01	18.40	112	.01	.01	-.00	2.
1.01	6.50	41	.02	.02	.00	4.	1.01	18.50	113	.01	.01	.00	2.
1.01	7.00	42	.02	.02	.00	4.	1.01	19.00	114	.01	.01	.00	2.
1.01	7.10	43	.02	.02	-.00	4.	1.01	19.10	115	.01	.01	.00	2.
1.01	7.20	44	.02	.02	.00	4.	1.01	19.20	116	.01	.01	.00	2.

1.01	7.30	45	.02	.02	-.00	4.	1.01	19.30	117	.01	.01	.00	2.
1.01	7.40	46	.02	.02	.00	4.	1.01	19.40	118	.01	.01	.00	2.
1.01	7.50	47	.02	.02	.00	4.	1.01	19.50	119	.01	.01	.00	2.
1.01	8.00	48	.02	.02	.00	4.	1.01	20.00	120	.01	.01	.00	2.
1.01	8.10	49	.02	.02	.00	4.	1.01	20.10	121	.01	.01	.00	2.
1.01	8.20	50	.02	.02	.00	4.	1.01	20.20	122	.01	.01	-.00	2.
1.01	8.30	51	.02	.02	.00	4.	1.01	20.30	123	.01	.01	.00	2.
1.01	8.40	52	.02	.02	.00	4.	1.01	20.40	124	.01	.01	-.00	2.
1.01	8.50	53	.02	.02	.00	4.	1.01	20.50	125	.01	.01	.00	2.
1.01	9.00	54	.02	.02	.00	4.	1.01	21.00	126	.01	.01	.00	2.
1.01	9.10	55	.03	.03	.00	6.	1.01	21.10	127	.01	.01	.00	2.
1.01	9.20	56	.03	.03	-.00	6.	1.01	21.20	128	.01	.01	.00	2.
1.01	9.30	57	.03	.03	.00	7.	1.01	21.30	129	.01	.01	.00	2.
1.01	9.40	58	.03	.03	-.00	7.	1.01	21.40	130	.01	.01	.00	2.
1.01	9.50	59	.03	.03	-.00	7.	1.01	21.50	131	.01	.01	.00	2.
1.01	10.00	60	.03	.03	-.00	7.	1.01	22.00	132	.01	.01	.00	2.
1.01	10.10	61	.03	.03	.00	7.	1.01	22.10	133	.01	.01	-.00	2.
1.01	10.20	62	.03	.03	-.00	7.	1.01	22.20	134	.01	.01	.00	2.
1.01	10.30	63	.03	.03	-.00	7.	1.01	22.30	135	.01	.01	.00	2.
1.01	10.40	64	.06	.06	.00	11.	1.01	22.40	136	.01	.01	.00	2.
1.01	10.50	65	.06	.06	.00	13.	1.01	22.50	137	.01	.01	.00	2.
1.01	11.00	66	.06	.06	.00	13.	1.01	23.00	138	.01	.01	.00	2.
1.01	11.10	67	.10	.10	-.00	19.	1.01	23.10	139	.01	.01	.00	2.
1.01	11.20	68	.10	.10	.00	21.	1.01	23.20	140	.01	.01	.00	2.
1.01	11.30	69	.10	.10	.00	21.	1.01	23.30	141	.01	.01	.00	2.
1.01	11.40	70	.17	.17	.00	32.	1.01	23.40	142	.01	.01	.00	2.
1.01	11.50	71	.25	.25	-.00	47.	1.01	23.50	143	.01	.01	.00	2.
1.01	12.00	72	.54	.54	.00	95.	1.02	0.00	144	.01	.01	.00	2.
									SUM	5.17	5.17	.00	1107.
										(131.)(	131.)(	0.)(	31.35)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	157.	23.	8.	8.	1123.
CMS	4.	1.	0.	0.	32.
INCHES		3.72	5.15	5.15	5.15
MM		94.49	130.91	130.91	130.91
AC-FT		11.	15.	15.	15.
THOUS CU M		14.	19.	19.	19.

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HYDROGRAPH ROUTING

ROUTING OF 10-YR FLOOD THROUGH CLOSED SYSTEM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
POND	1	0	0	0	1	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-914.	-1

STAGE	913.00	916.50	917.10	917.50	917.60	918.00	918.20	918.50	918.80	919.00
FLOW	0.00	.00	290.00	1170.00	1534.00	3030.00	4283.00	6010.00	8284.00	9720.00
SURFACE AREA=	0.	2.	4.	7.	10.	13.	18.	27.	34.	
CAPACITY=	0.	1.	4.	9.	13.	19.	27.	38.	68.	
ELEVATION=	913.	914.	915.	916.	917.	917.	918.	918.	919.	

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
916.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
916.5	0.0	0.0	0.

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

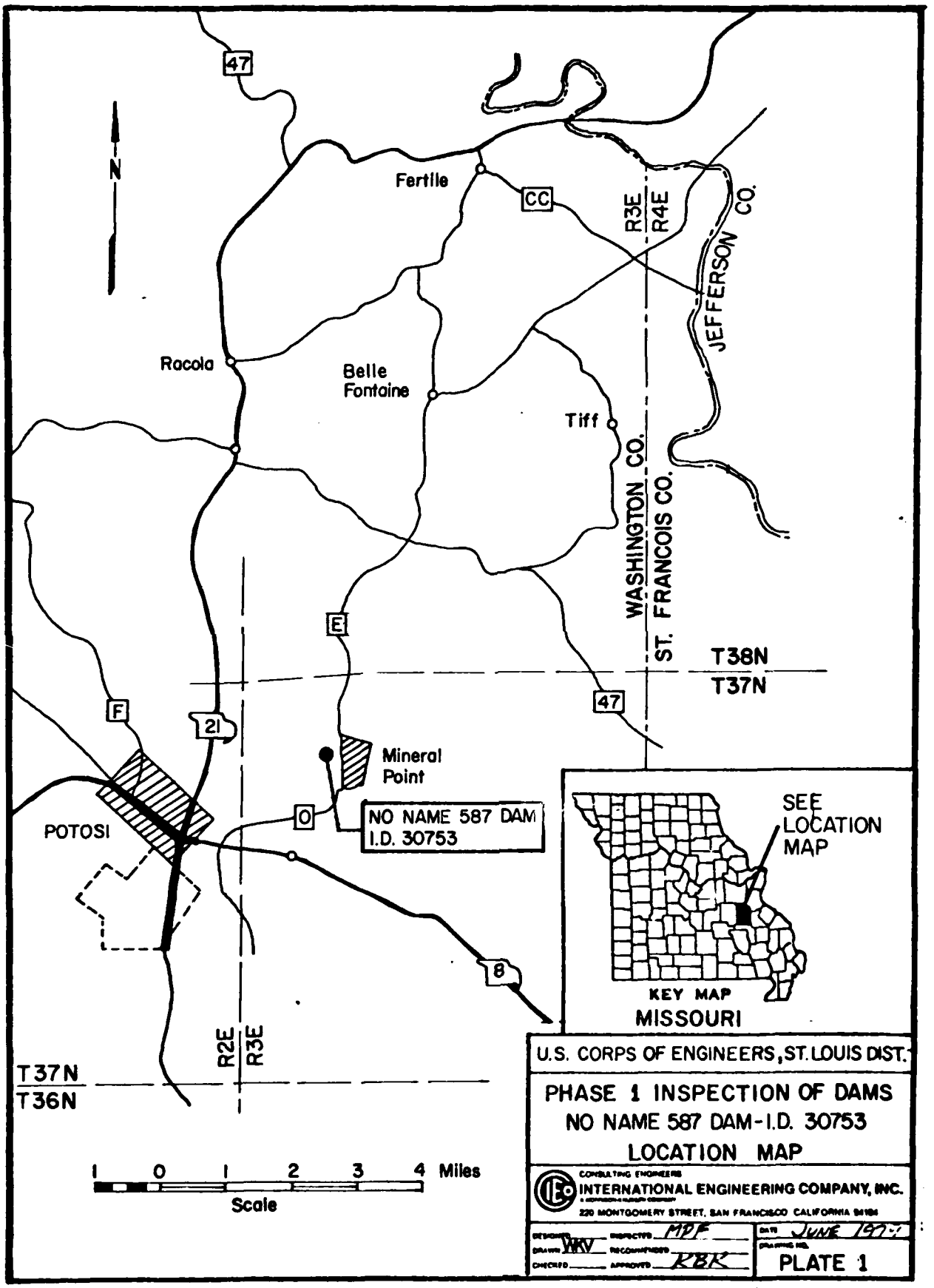
		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	INFLOW	157.	23.	8.	8.	.06
	(	4.45)(	.64)(	.22)(	.22)(	.15)
ROUTED TO	POND	5.	4.	1.	1.	.06
	(	.14)(	.10)(	.03)(	.03)(	.15)

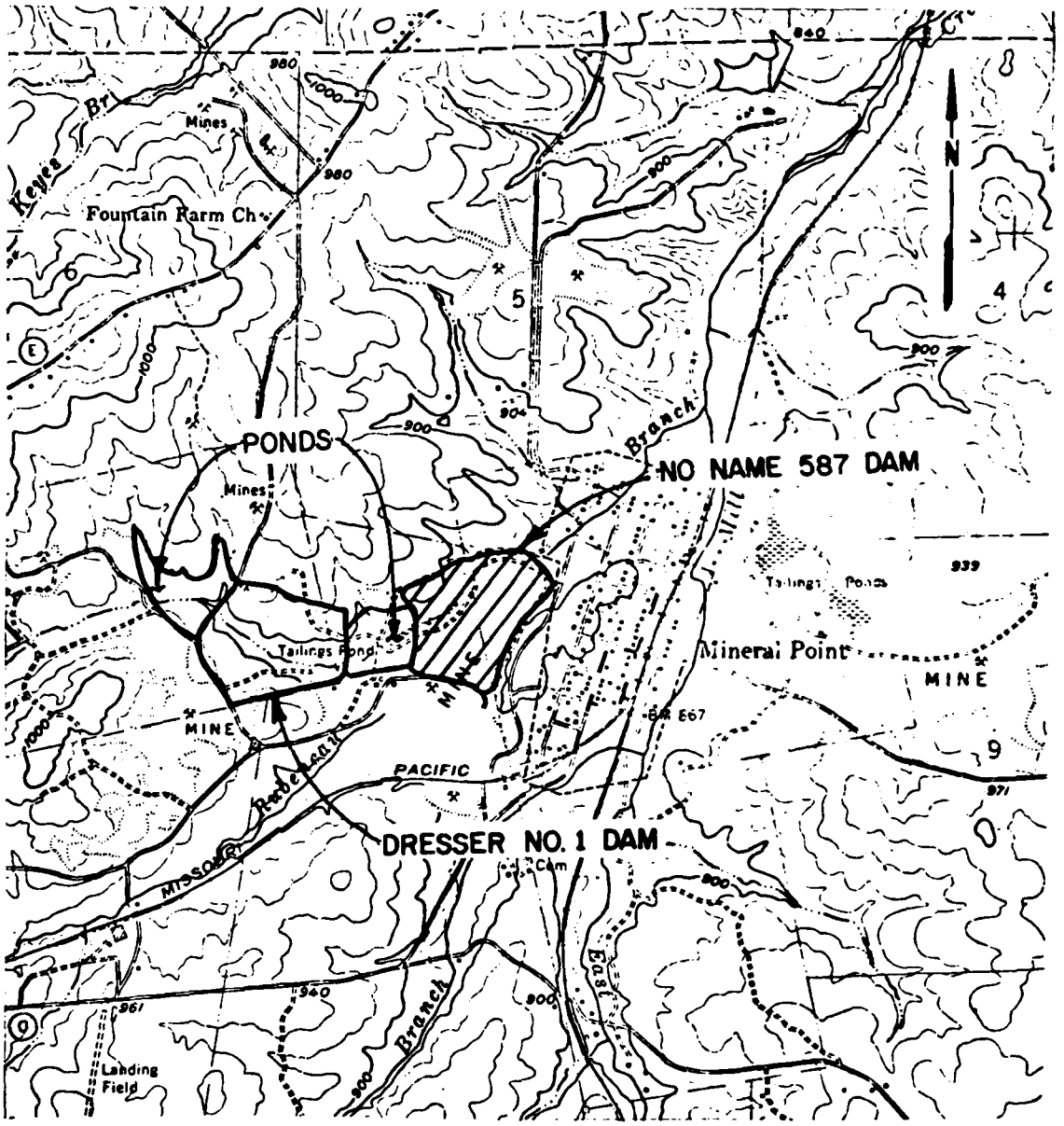
SUMMARY OF DAM SAFETY ANALYSIS

PLAN ...10-year...

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	914.00	916.50	916.50
STORAGE	1.	13.	13.
OUTFLOW	0.	0.	0.

MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
916.51	.01	13.	5.	9.50	15.17	0.00


47
N
Fertile
CC
R3E
R4E
JEFFERSON CO.
Racola
Belle Fontaine
Tiff
WASHINGTON CO.
ST. FRANCOIS CO.
E
T38N
T37N
47
F
21
Mineral Point
NO NAME 587 DAM
I.D. 30753
O
POTOSI
SEE LOCATION MAP
KEY MAP
MISSOURI
8
R2E
R3E
T37N
T36N
1 0 1 2 3 4 Miles
Scale
U.S. CORPS OF ENGINEERS, ST. LOUIS DIST.
PHASE 1 INSPECTION OF DAMS
NO NAME 587 DAM-I.D. 30753
LOCATION MAP
INTERNATIONAL ENGINEERING COMPANY, INC.
220 MONTGOMERY STREET, SAN FRANCISCO CALIFORNIA 94104
DESIGNED
DRAWN VKV
CHECKED
INSPECTED MDF
RECOMMENDED
APPROVED RBK
DATE JUNE 1977
PLATE 1



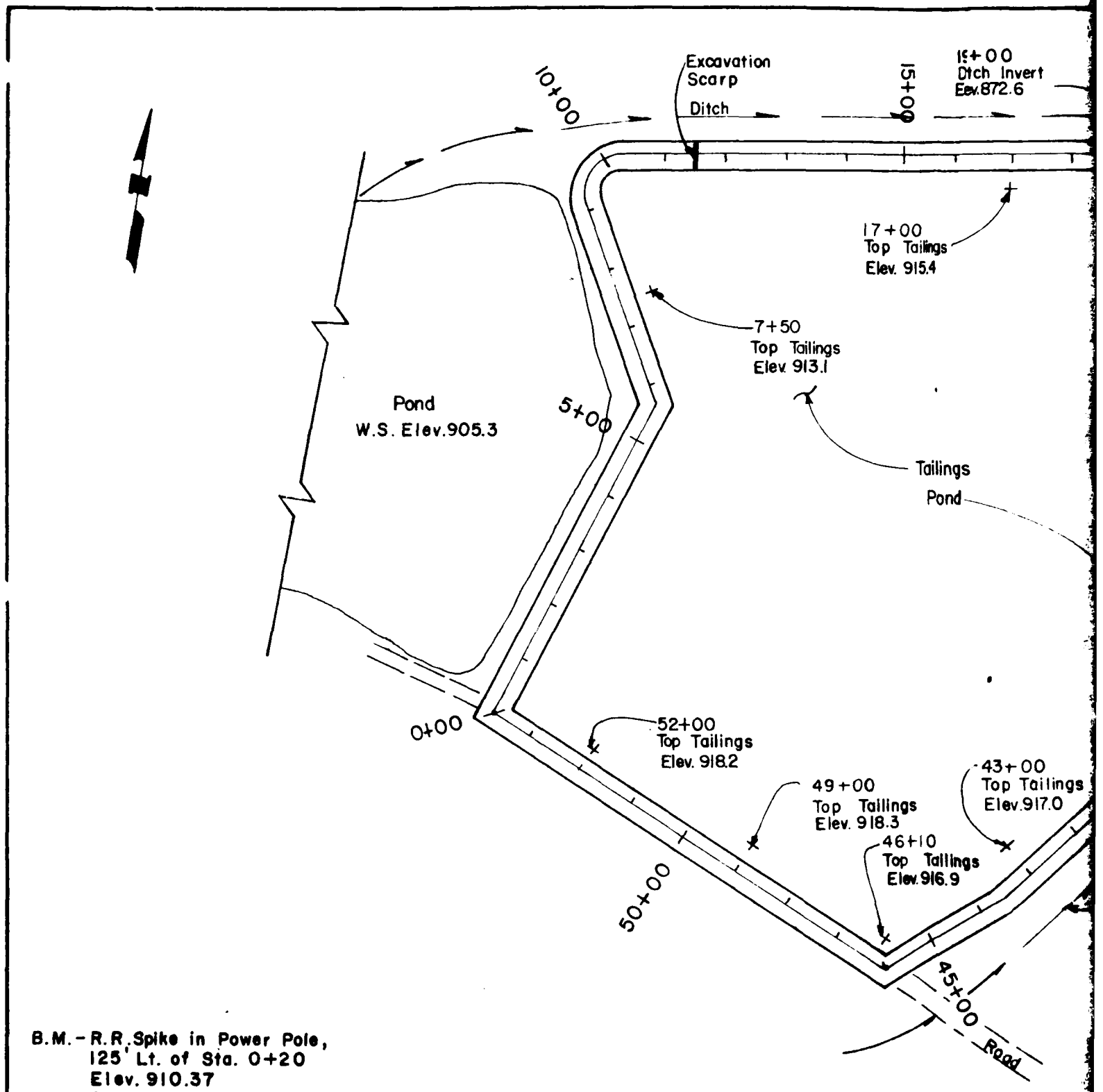
T37N, R3E

U.S. CORPS OF ENGINEERS, ST. LOUIS DIST.

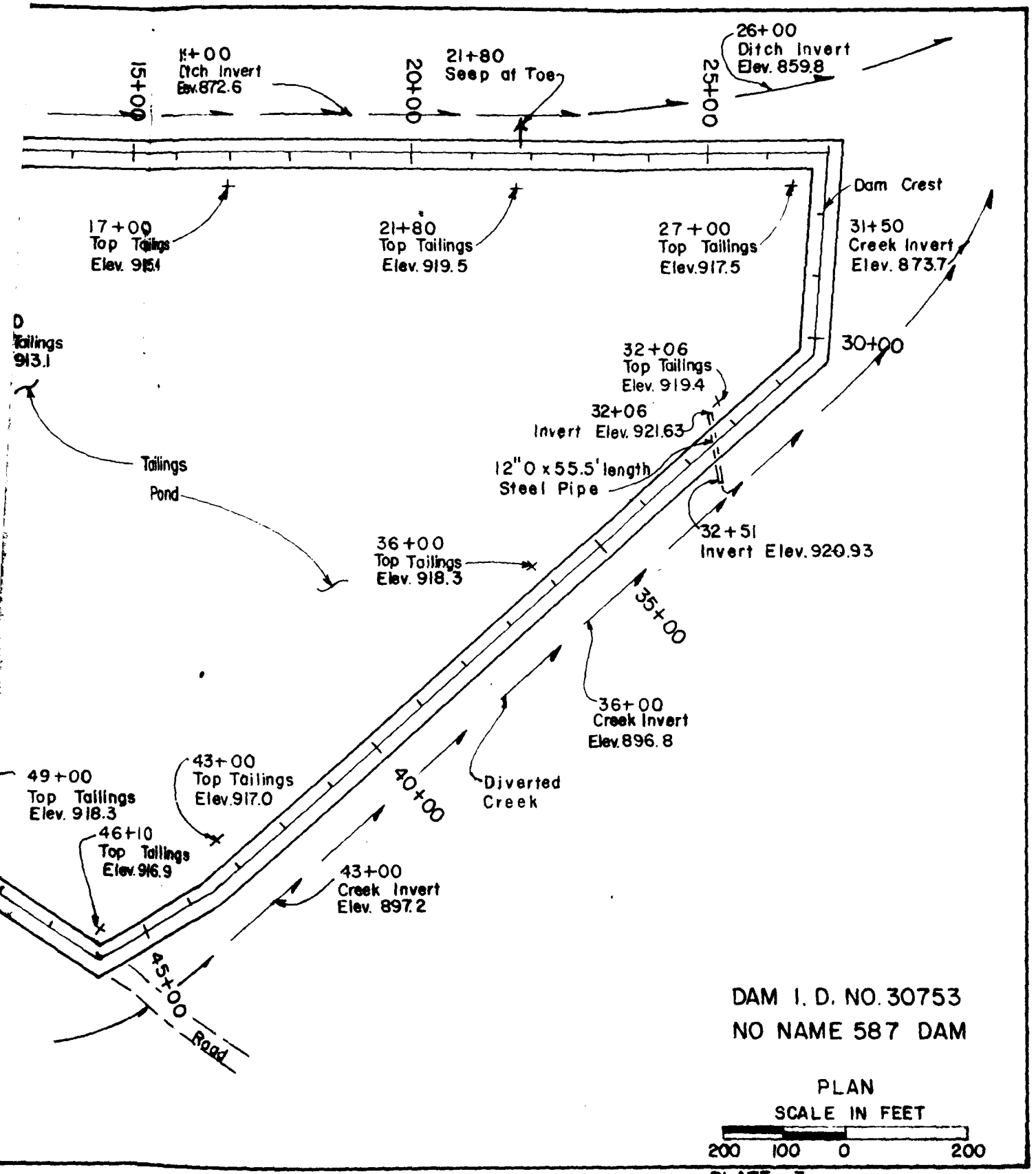
PHASE I INSPECTION OF DAMS
NO NAME 587 DAM - I.D. 30753
VICINITY TOPOGRAPHY

CONSULTING ENGINEERS
INTERNATIONAL ENGINEERING COMPANY, INC.
220 MONTGOMERY STREET, SAN FRANCISCO, CALIFORNIA 94104

DESIGNED — INSPECTED HDF
DRAWN MKV RECOMMENDED
CHECKED — APPROVED RBK
DATE JUNE 1979
DRAWING NO. PLATE 2



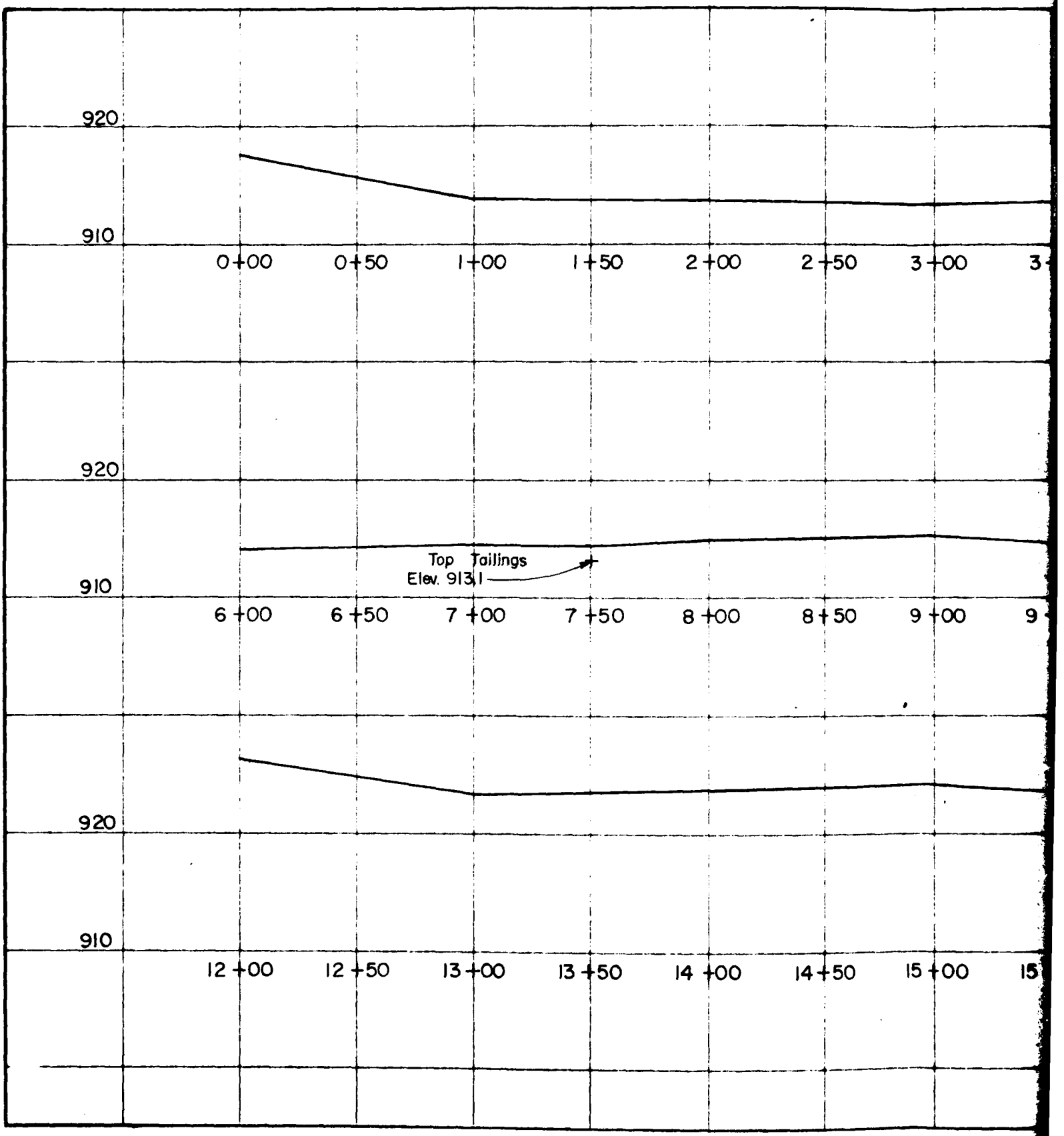
B.M. - R.R. Spike in Power Pole,
125' Lt. of Sta. 0+20
Elev. 910.37
Date of Survey: 4/3/79

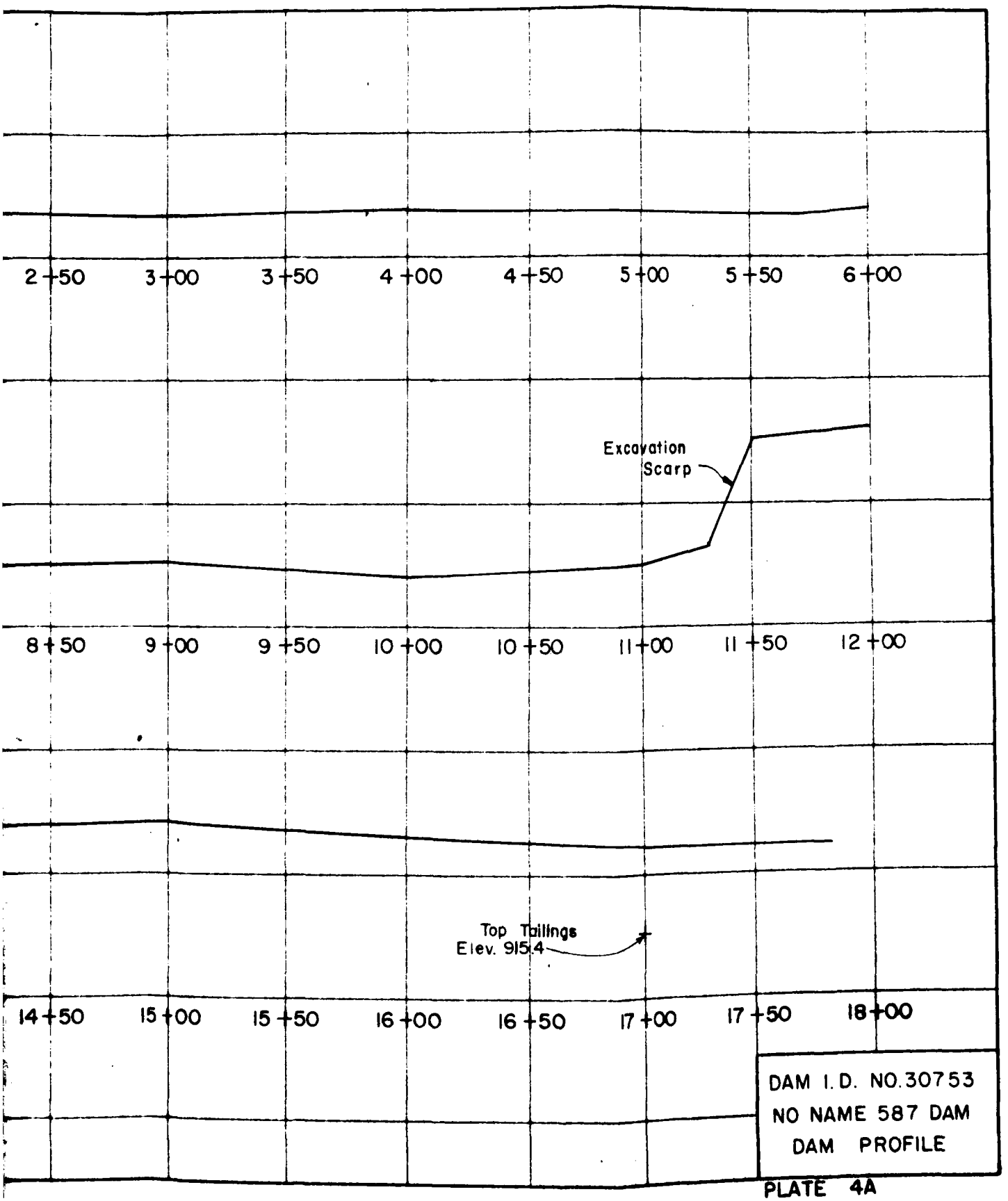


DAM I. D. NO. 30753
NO NAME 587 DAM

PLAN
SCALE IN FEET
200 100 0 200

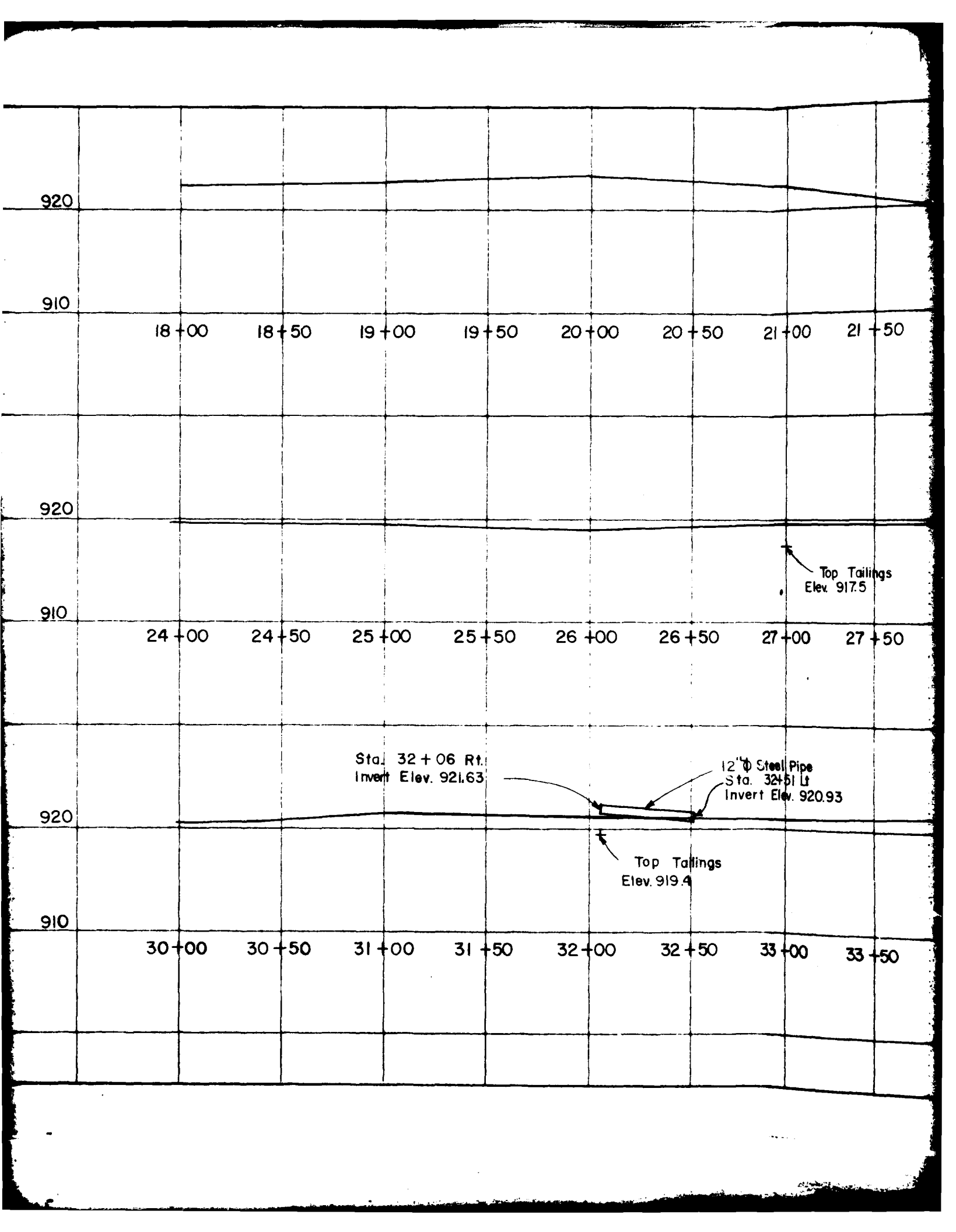
PLATE 3

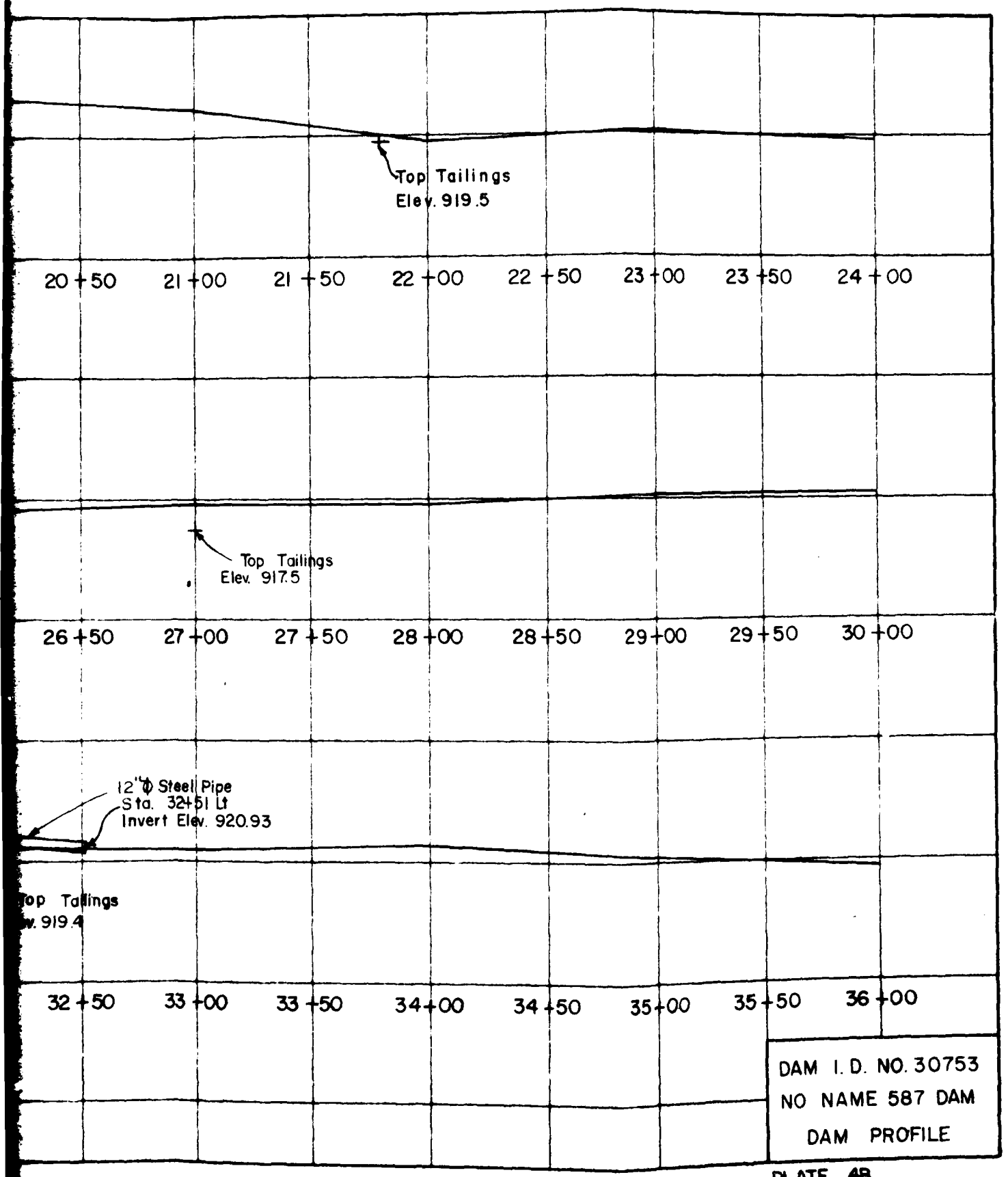

920
910
0+00
0+50
1+00
1+50
2+00
2+50
3+00
920
910
Top Tailings
Elev. 913.1
6+00
6+50
7+00
7+50
8+00
8+50
9+00
920
910
12+00
12+50
13+00
13+50
14+00
14+50
15+00



DAM I. D. NO. 30753
NO NAME 587 DAM
DAM PROFILE

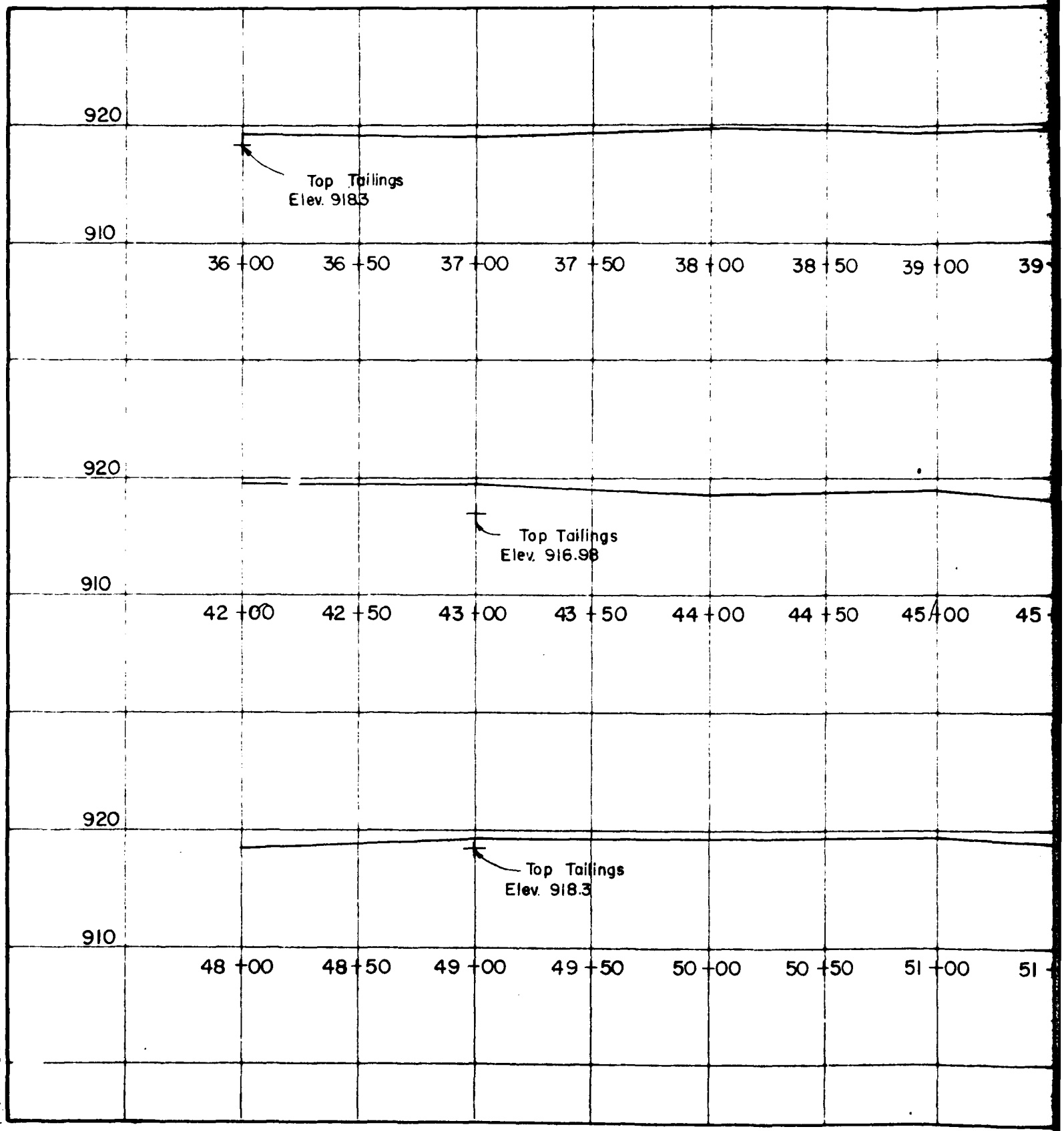
PLATE 4A

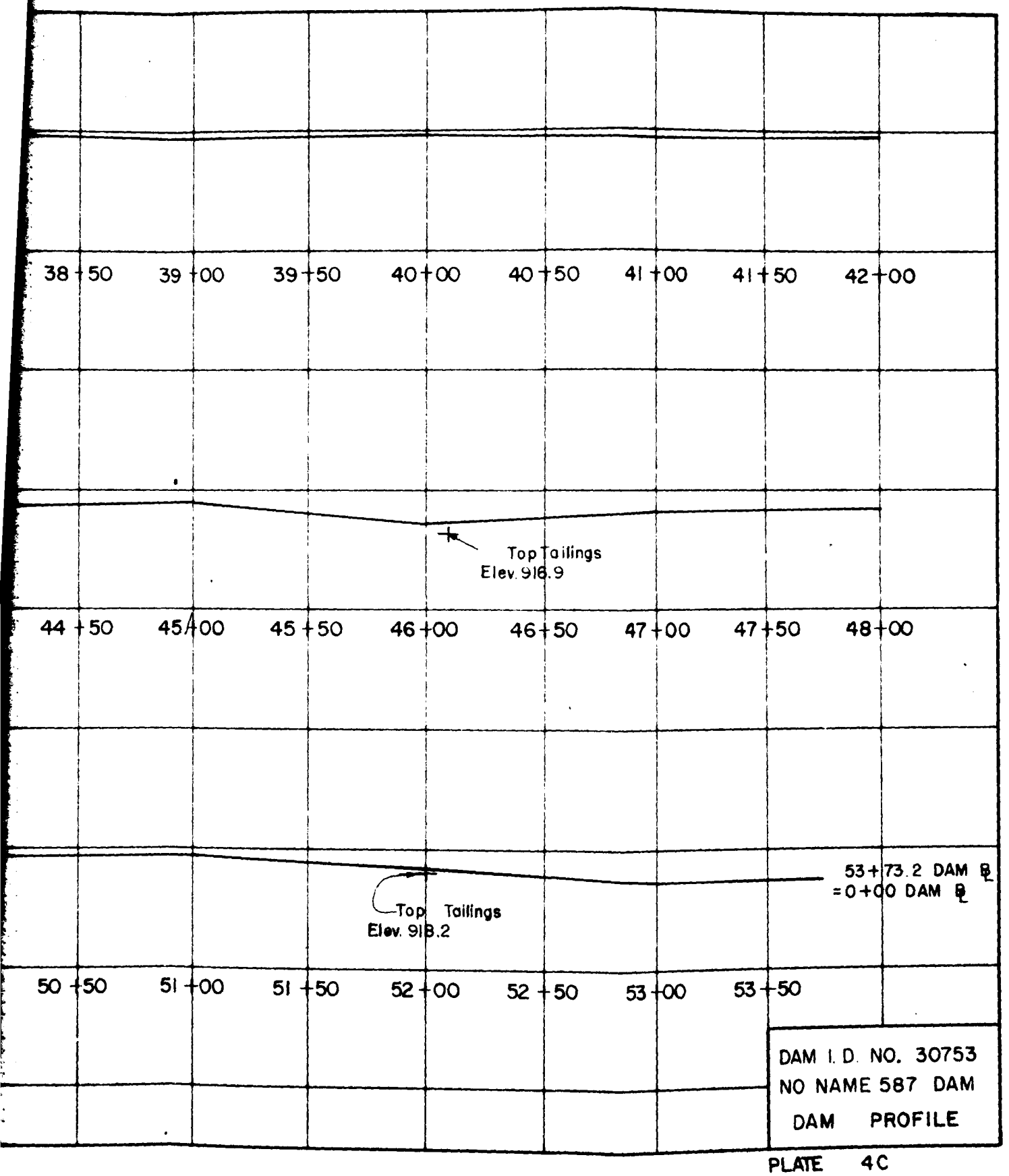

920
910
18+00
18+50
19+00
19+50
20+00
20+50
21+00
21+50
920
910
Top Tailings
Elev. 917.5
24+00
24+50
25+00
25+50
26+00
26+50
27+00
27+50
Sta. 32+06 Rt.
Invert Elev. 921.63
12"ϕ Steel Pipe
Sta. 32+51 Lt
Invert Elev. 920.93
920
Top Tailings
Elev. 919.4
910
30+00
30+50
31+00
31+50
32+00
32+50
33+00
33+50



DAM I. D. NO. 30753
NO NAME 587 DAM
DAM PROFILE

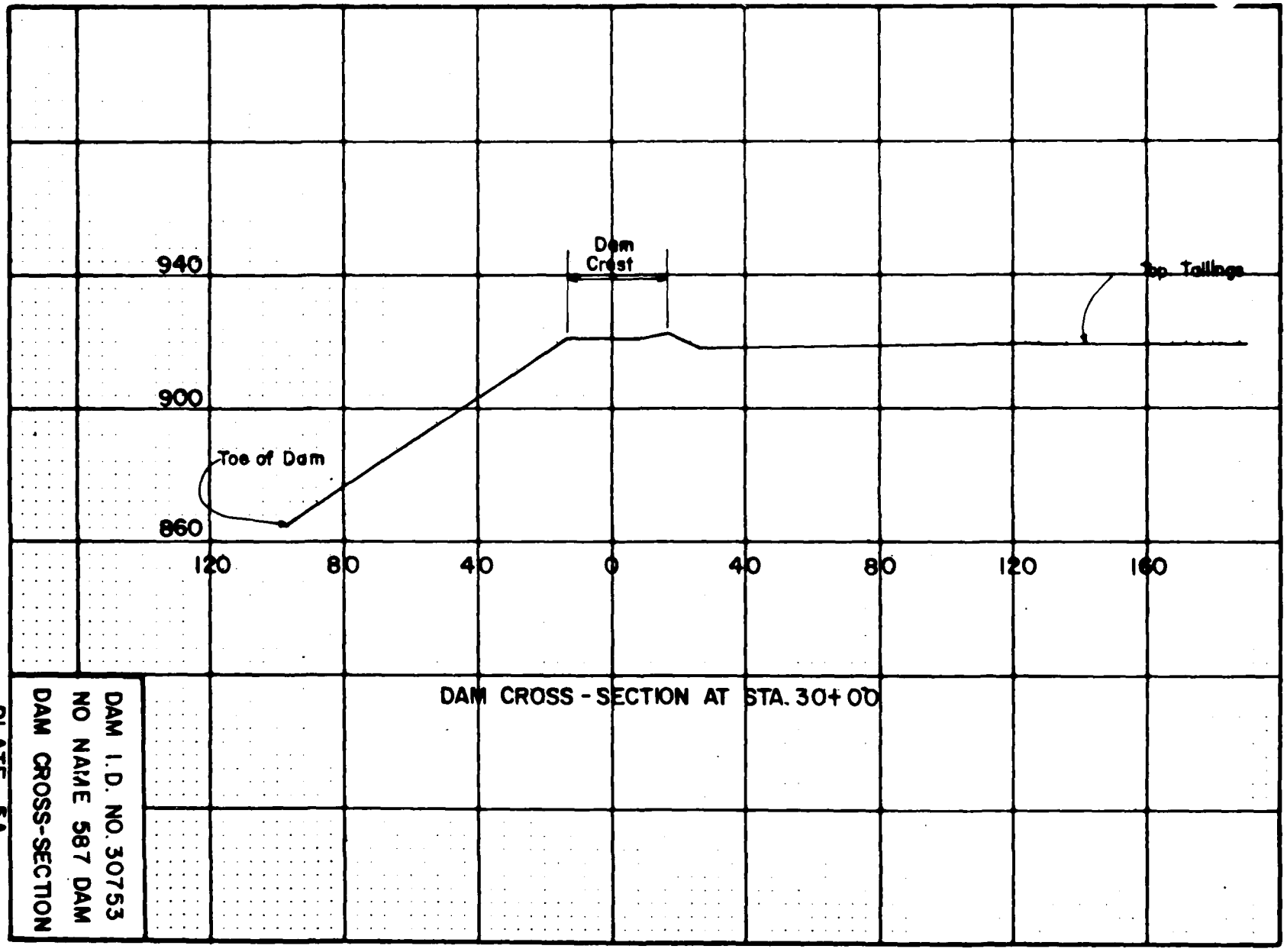
PLATE 48


920
910
Top Tailings
Elev. 918.3
36 +00
36 +50
37 +00
37 +50
38 +00
38 +50
39 +00
39
920
910
Top Tailings
Elev. 916.98
42 +00
42 +50
43 +00
43 +50
44 +00
44 +50
45 +00
45
920
910
Top Tailings
Elev. 918.3
48 +00
48 +50
49 +00
49 +50
50 +00
50 +50
51 +00
51



DAM I. D. NO. 30753
NO NAME 587 DAM
DAM PROFILE

PLATE 4C



DAM CROSS - SECTION AT STA. 30+00

DAM I.D. NO. 30753
NO NAME 587 DAM
DAM CROSS-SECTION

PLATE 5A

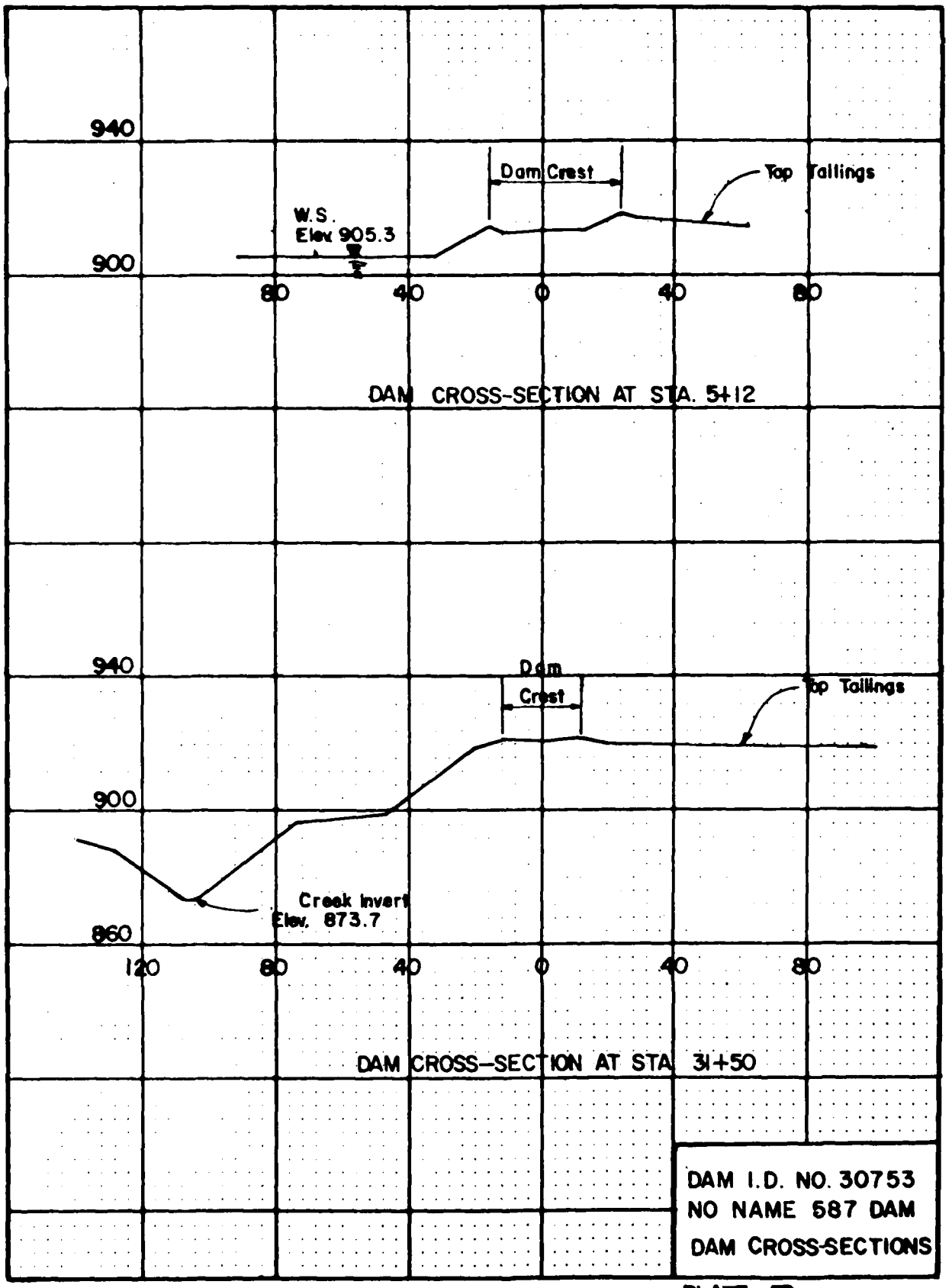
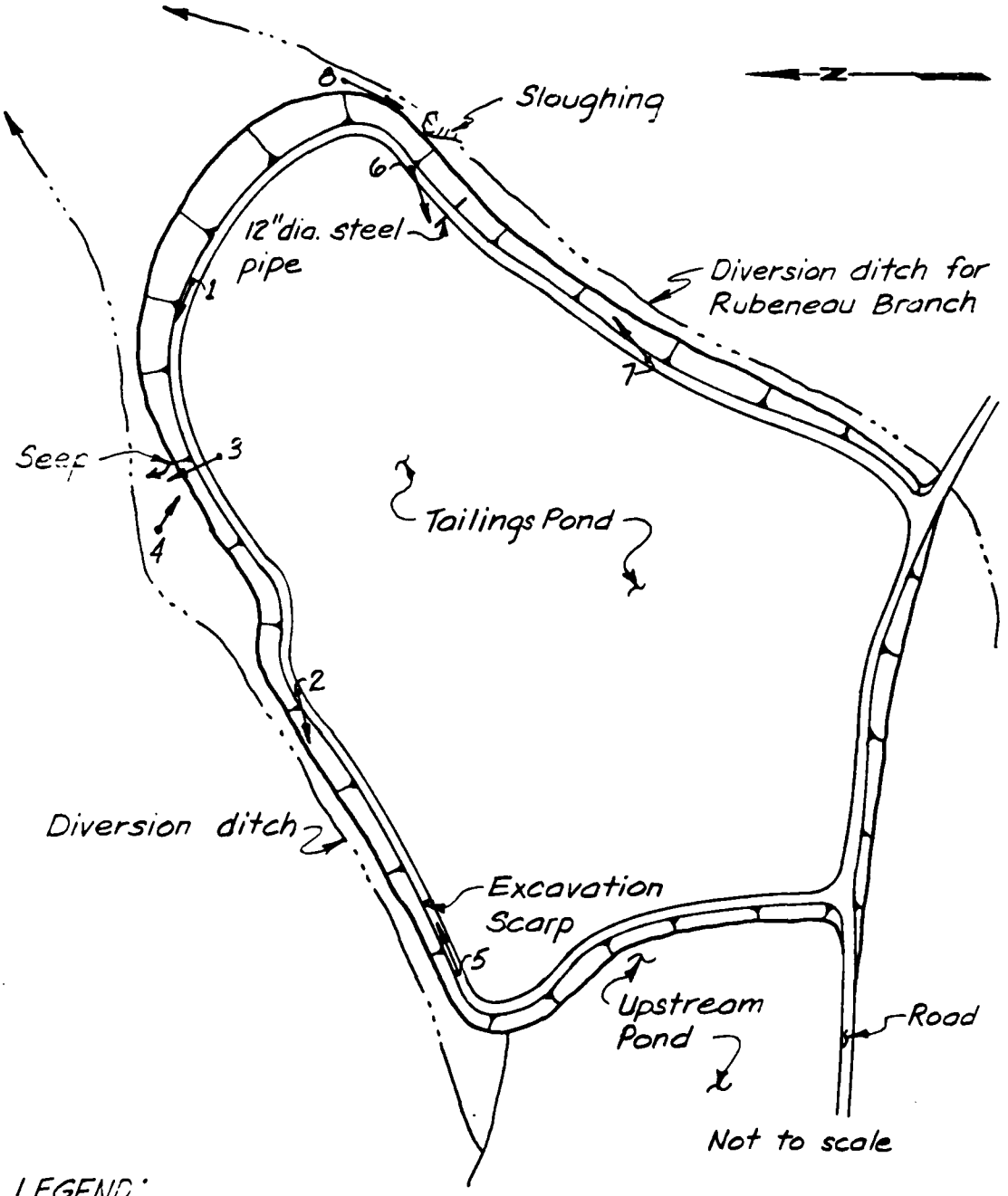

940
900
Dam Crest
Top Tailings
W.S.
Elev. 905.3
80
40
0
40
80
DAM CROSS-SECTION AT STA. 5+12
940
900
860
Dam
Crest
Top Tailings
Creek Invert
Elev. 873.7
120
80
40
0
40
80
DAM CROSS-SECTION AT STA 31+50
DAM I.D. NO. 30753
NO NAME 587 DAM
DAM CROSS-SECTIONS

PLATE 5B



LEGEND:

4 → Photo number and view direction

U.S. CORPS OF ENGINEERS, ST. LOUIS DIST.	
PHASE I INSPECTION OF DAMS NO. NAME 587 DAM - I.D. 30753 PHOTOGRAPH LOCATION MAP	
CONSULTING ENGINEERS INTERNATIONAL ENGINEERING COMPANY, INC. 220 MONTGOMERY STREET, SAN FRANCISCO CALIFORNIA 94104	
DESIGNED ____ INSPECTED HPF DRAWN W.K.V RECOMMENDED ____ CHECKED ____ APPROVED RWK	DATE June 1979 PLATE 6

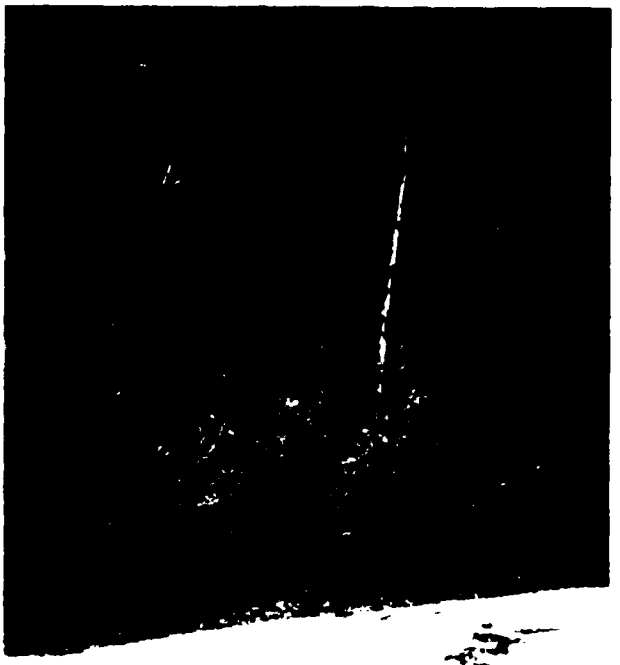
PHOTOGRAPH RECORD

NO NAME 587 DAM - I.D. NO. 30753

Photo No.	Description
1.	Downstream face of embankment at northeast corner of impoundment.
2.	Diversion ditch along north side of impoundment and gravel embankment.
3.	Seep at north side of impoundment.
4.	Close-up of the seep.
5.	Scarp resulting from gravel excavation at northwest corner of impoundment.
6.	12-inch diameter steel pipe at northeast corner of impoundment.
7.	Diversion ditch for the Rubeneau Branch along the east side of the impoundment and gravel embankment.
8.	Diversion ditch for the Rubeneau Branch at the northeast corner of the impoundment. Sloughing of foundation soil is in the foreground.

1

2



3

4

5

6

7

8